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APPLIED AND BASIC RESEARCH—PAGE THREE

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APPLIED AND BASIC *Research*

As technology becomes more complex, engineering progress depends more and more on research. Here it is asked that engineers acquire training in basic concepts of the sciences, so that they can translate with insight the scientific ideas that result in engineering realities.

By Dr. E. R. Piore

There has been great emphasis on basic research since the end of the War. An attitude has been created that no technological problem can be solved without first doing some basic research. It is appropriate before this group to examine this thesis and try to understand where basic research fits into the progress and growth of the engineering profession. This will permit us to look at the past and speculate regarding the future.

For purposes of this discussion, I consider basic research as science—that human activity that is motivated by the drive, the intellectual curiosity, to understand the external world; and engineering an equally noble desire to control the external world, to make life easier for man on earth.

Historically, the great engineering activities are symbolized in my mind by the construction of roads, aqueducts, bridges, and buildings—those modifications of the natural terrain that were so necessary to permit the growth of urban civilization, the cities and the communications net between the administrative centers of trade and government. The military and civil engineers thus started to practice their professions prior to the existence of the body of knowledge that we know as science.

The science that backed up this type of engineering starts budding in the seventeenth century, a period that is symbolized by Isaac Newton, the beginning of mathematical analysis which had its origin in problems associated with motion of bodies.

The next large step in engineering, which is associated with the Industrial Revolution, is in the field of power. Watt's steam engine is a point of departure. Here again the scientific basis for this technology occurs fifty years later. In the middle of the nineteenth century sufficient understanding occurs to permit the formulation of the law of conservation of energy, and a sound basis for thermodynamics emerges. It is difficult to untangle the relationships in these two engineering fields that have been mentioned as history proceeds, to determine whether science knowledge preceded engineering applications or vice versa. However, on the contemporary scene in the engineering fields that have been identified—civil and mechanical—it is clear that progress in a profound way can be made only with more thorough understanding of the physical world and more basic mathematical analysis.

Thus there were engineering activities that prospered without the support of science. There are other fields that do not follow that pattern. Let us return to the latter part of the nineteenth century and the ideas associated with Maxwell, Lord Kelvin, and J. J. Thomson. The notion of field and microscopic views of the world, as symbolized by the electron, the first identified elementary particle, produced engineering application only after basic research. The Atlantic cable and radio were possible because of science. The electric bulb and the vacuum tube, with Langmuir's experimentation and speculation, were possible because of basic research. Generally one can observe that the utilization of the microscopic properties of matter, if you permit me to continue this very broad paint brush analysis, depended on science. Transistors and nuclear reactors are cases in point. Further progress in these areas must rely very heavily on gaining greater understanding of the external world. This is also the area on which industrial laboratories concentrate their effort. Similar observations can be made with regard to chemistry and chemical engineering.

Parenthetically, let me observe that under the category of the microscopic view of the world we can inject a new field of bio-engineering, a field that started to bloom with the production of antibiotics, vaccines, and the use of micro-organisms in industrial processes. It is interesting to note that in the biological area the applications are very often ahead of basic understanding. This is in contrast to the views that were presented in the physical sciences examples.

I have touched on a bit of the past and the present. Now let us speculate about the future. I shall select a field that is of great interest to me and it is still so vague that it lacks an accepted name, thus lacks an agreed body of systematic knowledge to be called a science or engineering field. I shall refer to this field as systems and information engineering.

After the war the military departments started to stress systems. This

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This is an extended outline of a talk presented by Dr. E. R. Piore at a meeting of Engineers Joint Council in cooperation with the Western Society of Engineers on May 19, 1958 in Chicago. Dr. Piore is director of research, International Business Machines Corporation, New York, N. Y.

stress has led the Air Force to deal with systems contractors. These vague ideas have generated many speeches and papers. Very often there is profound articulation with questionable wisdom. The problems are real, the lack of clarity indicates that it is a troublesome area and scientifically we have to get hold of it. Engineering is proceeding and not waiting for basic research.

In trying to sharpen up these vagaries, let me cite some examples. The obvious one generated by the Air Force concern is an airplane system composed of an airframe, engine, electronic gear inside and outside the aircraft structure, the men operators, etc. In this complex of black boxes and men, operating on different technological bases, on different scientific disciplines, the basic question that is asked is, how is the system optimized. The approach is a highly empirical one. Optimization includes a number of factors and possibly the most important are optimum performance coupled to optimum economy in terms of initial operating costs, etc.

The systems problem faces the automobile manufacturer. With increasing pollution of the atmosphere due to industrial waste, the automobile fabricator finds himself in a position where the automobile must be so designed that the contribution to atmospheric pollution is minimized. Thus this is no longer a mechanical engineering problem but must include the chemical understanding of completely burning the fuel to a nonpolluting ash—or gas is produced; further, local meteorological conditions in the area in which the automobile will operate must be a factor to obtain an economical solution to the problem. The automobile industry has been introducing a number of improvements such as automatic transmission and steering, light dimmers, greater automation in braking, which may reduce the safety of the car-driver system. This can occur if the aids just identified induce inattention on the part of the operator so that his ability to react to emergency conditions is modulated.

The final example is the large digital computer, which is a complex system. Although the components of these machines—transistors, vacuum tubes, memories—have firm roots in science, the design of a computer is highly empirical and it is an art.

Thus three systems problems do rely on such technological techniques as operational research, information theory, and engineering psychology. Generally the systems problem is characterized by the need to optimize or pull together engineering effort that has its technological base in a number of scientific and engineering fields, plus the added factor of man and his environment. One must understand the information that man and his environment can give to the system so that it can operate and perform and react on man and his environments in a desired predictable fashion.

This general area of "soft sciences" and coupling man and his environment to a machine will get its initial understanding among engineers. Problems will be solved and machine complexes will be used successfully prior to obtaining the basic information. There is a great opportunity for basic research and at present the engineering faculties and industrial research laboratories are in the forefront in exploiting this opportunity, although the progress is slow and at times the rewards are nonexistent.

I have touched on a future field of basic research that will have a profound effect on engineering progress.

What are the prospects for research in the other engineering areas that have been identified at the beginning of my talk, civil and mechanical, the microscopic world; electronics, biological and chemical, the microscopic world; and systems engineering, the integrated world.

The current interest in science departments in universities and research laboratories in industry in the microscopic world ensures a continued flow of basic information to continue the exploitation of these fields by the engineering professions. Engineering schools, as they expand their programs, are also providing training through research and teaching in these areas. Engineering undergraduates are also getting exposure to the microscopic structure of matter. Thus growth is assured.

The civil and mechanical engineering that made such profound progress without initial roots in science, which has a continuing important contribution to make to our industrial society, faces limited support at present from the scientific community. Our science departments, as has been noted, are focused on the microscopic phenomena characterized by quantum mechanics and the area of classical physics; and the associated mathematical analyses are receiving limited attention by the science departments. The engineering schools on the whole have not taken up the slack. Thus there is a lack of a large body of creative people, sufficient to meet our

(Continued on Page 18)

THE *EGGHEAD* AND *I*

by H. G. Thuesen*

THE REALIZATION that our national security rests on knowledge so abstract that most of us do not comprehend it, and perhaps are not capable of understanding it, is a little disquieting. We are forced to face the fact that there are persons who have minds superior to our own; that we are dependent upon them. We view these great minds with awe, but at the same time we may feel that such endowments are a bit unfair to us. Perhaps that is why we hear such terms as "egghead," "brain," and "longhair."

However, if we are generous enough to recognize that "eggheads" have superior intelligence, we still may save face, if that is necessary, by a self-contented interpretation that they are impractical—mathematicians who cannot figure their grocery bill, or physicists who cannot repair the washing machine. Actually, this so-called impracticality is their chief virtue. If they were practical most of their thinking would not be concerned with formulating various theoretical concepts — forerunners of our material progress and security.

Unless you are one of the few with a superior mind, you may ask: "Just what are these eggheads and what do they mean to you and me?" In my opinion, the true longhair, or egghead is a person with an unusual mental capacity. He is a pioneer in the area of thought; a pioneer who goes beyond the present frontier of knowledge to discover new knowledge. He uncovers secrets which nature is reluctant to reveal. He conceives ideas which break through barriers to progress. He provides intellectual leadership in science, in art, in religion, in government, and in all other pursuits of man.

Perhaps all of us can do this in some degree, but the egghead I visualize does this in a superlative degree. In short, the true egghead is a genius, and there are not many of him. He occurs with a frequency of perhaps one per million population. At this rate there would be about 170 in the United States; 2,700 in the world. They are so scarce that many of us will never hear directly an egghead's voice, and fewer of us will ever shake one's hand.

Why should we be concerned about them? The fact is, we live today on their discoveries and theories, and will depend upon them for our survival in the future.

The well-being of a community depends upon its tools, physical and mental for exploiting its natural resources. Mental tools, knowledge, become increasingly important in the scheme of things as we progress. Our marvelous physical tools are easily built, once the theories on which they rest have been mastered.

In organized society we may live at a level of well-being commensurate with the wisdom of our most wise—our eggheads, if you please. We only need to pick up the mental tools they provide for us, apply them, and thereby enjoy the many resultant benefits.

Without the knowledge discovered by the English chemist and physicist, Michael Faraday, you and I today would not be enjoying the boon of electricity and the things it makes possible, such as lights, refrigerators, telephones, radios, televisions, X-rays, hi-fi, etc.

Germ diseases like diphtheria, small pox, pneumonia, and typhoid began to wane as a threat to you and me when the French chemist, Louis Pasteur, and the English surgeon, Joseph Lister, conceived the idea of micro-organisms being the cause of disease.

Similarly, we may breathe more easily because of the more recent Dr. Jonas E. Salk, whose pioneering in vaccines has nullified the terror of polio virus. Here again is an illustration of the fact that once the basic concepts and theory involved are mastered, the practical problem of inaugurating sanitary practices and manufacturing drugs and vaccines becomes relatively simple.

You and I set a better table because of Gregor Mendel's laws, an early "egghead's" discovery of the basic laws of genetics. Even now, better strains of animals and plants, which provide more food at less cost, continue to flow from his contribution to our knowledge.

Thus, nearly all that we count as progress had its beginning as ideas originating from these and other superior minds.

The mental resources of the world might be viewed in the form of a pyramid. At the very top are the geniuses, the so-called eggheads. Their ideas, concepts, and knowledge are so profound that they can be appreciated and truly understood only by other persons of greatly superior intelligence. In turn, the ideas, concepts, and knowledge of the second layer of intellectuals are so difficult that insight into them is limited to the highly intelligent. Below them are other layers of mentalities, reaching down to the average and even below-average minds. But, whatever a person's position in the pyramid of mental resources, he benefits from those above him. There really is nothing more democratic than knowledge, because its benefits flow quickly to all.

*Professor of Industrial Engineering and Management, College of Engineering, Oklahoma State University. Reproduced from March, 1958, issue of the Oklahoma State University Magazine.

One wonders why a nation such as ours, that places such a high value upon progress, accords so little esteem and prestige to the eggheads who are, in a large measure, at the head of our progress. One reason may be that as a whole we are a very practical people in the material sense. Thus, we tend to rate higher the person who applies a theory in the accomplishment of a practical task, than the person who works out the theory upon which the practical accomplishment is really dependent. Monetary and other compensations in the area of practical application often greatly exceed that provided for in the search for new knowledge.

This scheme of values tends to encourage many capable minds to abandon intellectual pioneering and devote their thought and energies to what we refer to as the practical pursuits.

Actually, what could be more practical than the theoretical knowledge that enables us to gain desirable ends which otherwise are unattainable by the practical "know how" now existing?

Another deterrent to giving intelligence its due credit may be the great emphasis we place on material success. The command of material things up to the point where families can have sufficient food, adequate clothing and shelter, and machines to do away with drudgery and make available to us the news, science, literature, music and art, certainly add much to the enjoyment of life. However, when over-long, over-powered, over-chromed cars and other forms of material ostentation become ends in themselves, materialism makes little sense. For example, to repair a damaged fender of a popular automobile may cost as much as a year's education for a child.

Gross materialism appears not to be the way to happiness, or survival. If held in too high esteem, it is an unfavorable climate for the very mental development that made it possible. Each of us would benefit from a social outlook such that a powerful mind would be the subject of more excitement than a powerful automobile, and such that a great intellect would be held in greater awe and respect than that attributed to great wealth.

One of the anomalies of the present is that we as a people go to great lengths to provide machines in order that we may avoid physical exertion. Yet, we read more column inches about sports than perhaps any other single subject. In our race for survival, it is unlikely that our adversaries will challenge us in athletic contest. When we put physical attainment ahead of mental achievement, and when sports are of greater concern to the community than the education of its youth, there exists a climate unfavorable to the development of the mentally gifted—the "eggheads" and the "brains," if you choose to call them that. As a result, you and I are deprived of the benefits their genius might bring to us.

Granted that the eggheads at the top of our intellectual pyramid are the pacemakers of progress by virtue of their "break-through" concepts and ideas, and since it is through their ideas that our own lives become more meaningful and challenging, what can we do to stimulate the mental achievement of our most gifted?

Perhaps the most important thing is for each of us to realize, and help others to realize, that the development of superior talents is in the best interest of us all.

We should revere knowledge, and accord esteem and prestige to intellectual achievement.

We need to realize that what is practical today is but the result of yesterday's theories. We must learn that abstract knowledge, unintelligible to us today, may bring us understanding tomorrow.

Intellectual achievement should enjoy at least equal status with physical achievement in our scheme of values.

The education of our children should be among our most urgent concerns.

The instructors of our youth should be the community's most capable and most talented persons, and they should be compensated accordingly.

We must neither demean the intelligent, nor scoff at the successful.

We must defend intelligence and encourage its development as the best and most reliable way by which we can realize our aspirations.

If we do all these things and pay practical homage to our "all-American Intellectuals," our material progress will increase proportionately as well as our ability as a nation to assume the leadership role in the space age so near at hand. As a matter of fact, our national welfare and security will depend on what our so-called "eggheads" and other intellectuals accomplish.

All Abuzz

Textile makers are buzzing over a new "wash and wear" finish for cotton piece goods that reportedly withstands as many as 180 commercial launderings, reports *Chemical Week*. The finish will not turn yellow after repeated launderings.

Argonne Lab Builds 20 Reactors

Most of today's gleaming, modernistic-looking nuclear reactors consist basically of tanks or vessels surrounded by heavy shielding.

Yet many of them are still designated as "piles" within the ranks of atomic scientists.

The Argonne National Laboratory—the nation's leading reactor development center—has built more than 20 nuclear reactors, going back to the dawn of atomic energy more than 15 years ago.

A great number of these plants—both past and present—bear the designation "CP" (Chicago Pile) and the term "pile" until recent years was widely used as a synonym for all reactors.

Webster's dictionary defines "pile," as applied to science, as ". . . an arrangement of fissionable material with a moderator (as carbon or heavy water for slowing down neutrons) and regulating devices, designed for producing and controlling a chain reaction."

This definition covers the characteristics of most reactors (except for fast reactors, which have no moderator). But the term "pile" does not specifically apply to most of the present, and the future generations of reactors.

How did "pile" come to be used in designating nuclear reactors, and why is it still used by Argonne National Laboratory?

The story goes back to the beginning of the atmoic age. The scene was the war-time Metallurgical Laboratory at the University of Chicago.

There, during 1941-42, a group of scientists and engineers led by the late Dr. Enrico Fermi was building the world's first reactor.

On December 2, 1942, Dr. Fermi and his associates achieved the first controlled nuclear chain reaction under the West Stands of Stagg Field at the University of Chicago.

Dr. Norman Hilberry of La Grange, Ill., was one of the scientists present at the historic moment.

He said, "The first reactor was, in fact, a pile of graphite bricks, some of which contained lumps of uranium fuel.

"When the time came to give the reactor a name, 'CP' (for Chicago Pile, or Chain-Reacting Pile) seemed very appropriate. It not only described what the reactor was, but stood as a symbol for the almost incredible simplicity of the basic idea.

"So Fermi's reactor became CP-1, first of a long line of major Argonne nuclear reactors."

Dr. Hilberry pointed out that all of the early research reactors were piles, including those at other National Laboratories around the nation. But with the advent of reactors such as the Argonne "heavy water" pile (CP-3) and other similar heavy water and light water moderated systems, plants came into being which were not "piles" in the strict sense (graphite bricks). They were made of metal and concrete, with the cores contained in tanks or vessels.

One example is Argonne's Experimental Boiling Water Reactor (EBWR), which is called "CP-7" in the "family tree" of Laboratory reactors.

Dr. Hilberry said, "We are still using the term 'pile' to designate various Argonne reactors because of ease in numbering and chronology. That term was so simple and apt at the beginning that it has stuck down through the years, partly because of convenience and partly because of habit."

However, there are still some reactors that actually are "piles." Included in these are the plutonium-producing plants at Hanford, Washington, research reactors at Oak Ridge and Brookhaven National Laboratories, and the Calder Hall and Windscale power reactors in Great Britain.

In general, none of the so-called "piles" were random collections of fissionable material and moderator, but were orderly arrangements of these constituents. This might be illustrated by the contrast between a well-arranged cord of wood, and the woodpile left by a woodcutter and his buzz saw.

The Argonne National Laboratory is operated by the University of Chicago for the U. S. Atomic Energy Commission, and is located on a 3,700 acre tract of land 25 miles southwest of Chicago near Lemont, Ill.

Moon May Aid TV

The recent transmitting of radio signals from one continent to another via the moon has brought transoceanic television a step closer, reports *Products Engineering*. Signals that were reflected by the moon were received at Bonn University from Fort Monmouth, N. J. The receiving aerial developed by the Bonn Observatory—which could aid intercontinental TV—is said to be 50-to-100 times cheaper than super aerials now used in the U. S.

Toll Road Section Opens Aug. 20

The 76-mile Northwest Tollway—linking South Beloit, Rockford, Belvidere, Elgin, and O'Hare airport at Chicago's northwest gateway—will be opened to the public on Wednesday afternoon, August 20, less than 23 months after construction began.

The Lake county portion of the Tri-State Tollway, extending 30 miles from a direct connection with Edens Expressway to Route 41 at the Wisconsin line, will be opened on August 27, approximately 18 months after construction began on this section.

This was announced by Austin L. Wyman, chairman of the Illinois State Toll Highway commission. Wyman said opening of the Northwest Tollway will be in connection with civic celebrations to be staged at various communities along the route.

George L. Jackson, WSE past president, is chief engineer of the Illinois State Toll Highway Commission.

Charles L. Dearing, executive director, said that the schedule had been planned to provide opportunity for the civic celebrations and to enable initial travel by the public with the greatest safety at the earliest feasible date.

"For that reason, the Northwest Tollway will be opened in two stages," he said. The section from the Fox River east to Devon Avenue and Higgins road will be available in the early afternoon at the conclusion of a ceremony to be held on the tollway near Elgin. Westbound traffic will have access to the Northwest Tollway from Devon avenue and eastbound traffic will leave the tollway at Higgins road. All interchanges on this route will handle traffic.

"In the late afternoon, following a similar dedication ceremony at the route 20 interchange east of Rockford, the western portion extending from the Fox River to South Beloit, will be opened."

Although the Lake county portion of the Tri-State Tollway will open August 27, dedication ceremonies will be postponed until the entire Tri-State Tollway is available about December 31 of this year.

"Opening of the Northwest Tollway marks another milestone in a continuing transportation progress," Dearing said. "The relationship between time and distance shrinks again and Chicago with its satellite suburbs and Rockford and its environs become closer neighbors and economic cousins.

"Similarly, Milwaukee and Chicago and the intermediate cities figuratively move closer together with the addition of the north Tri-State section. Both the Northwest Tollway and the north portion of Tri-State Tollway link into Chicago's Expressway system. Completion of this expressway, now scheduled for 1960, will provide direct access to Chicago's Loop area.

"Design and construction of the 187-mile tollway began Jan. 21, 1956, with the completion of the sale of $415,000,000 in revenue bonds," Dearing said. "The engineering and land acquisition program was pressed from the start to enable breaking of ground on the first construction section near Rockford on Sept. 22, 1956. Our financing program contemplated that the first revenues would begin on Jan. 1, 1959. However, we are opening several months in advance of scheduled revenues and expect our administration staff to gain valuable operating experience."

William Harrison Fetridge, chairman of the Illinois Tollway Dedication Committee, said that the opening ceremonies on August 20 will involve an automobile caravan headed by Governor William G. Stratton, accompanied by officials from Illinois and neighboring states, toll highway commission members and officers, civic leaders, and others.

The caravan will start at the service area near O'Hare airport and move west. Ceremonies are scheduled at the service area on the tollway near O'Hare airport, at Elgin, at Hampshire, at Belvidere, and at Rockford, he said. Local committees in each city are currently planning the details of their participation in the overall program.

At the conclusion of the Elgin ceremony, the Northwest Tollway will be open from the route 25 interchange to the temporary eastern terminus at Higgins road and Devon avenue in Chicago.

The caravan will then proceed west with stops at the route 20 interchange near Hampshire and at Belvidere and will end at the route 20 interchange east of Rockford. Representatives from South Beloit and Wisconsin are expected to participate in the ceremony at Rockford. This will culminate in the opening of the western section, extending east from South Beloit to the route 25 interchange at the Fox river near Elgin.

At South Beloit, traffic will move to and from route 51 and the tollway via temporary ramps on Rockton Road, pending completion of an interstate expressway to Janesville and Madison.

New Mining Site Names for Atlas

You won't find on the map today some of the places where mining engineers are developing a "Mesabi to the North," as reported in a recent issue of *Mining Engineering*, official magazine of the Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers. But these sites soon will be in the average atlas, predicts the publication in a review of enterprises under way in the Labrador Trough, "already shown to be one of the world's greatest iron ore provinces."

"Center of activity and interest lies in the mid-southern part as drills, equipment and money start to pour into the area near Mt. Wright and Wabush Lake," says the article. It points to the recent Jones & Laughlin and Cleveland Cliffs Iron Co. announcement of an estimated billion-ton deposit for future operations; the rumored railway for U.S. Steel's Quebec Cartier projects in the Mt. Reed region and IOCC's decision to step up the timetable on its program in the Wabush Lake area east of Mt. Wright.

"Already occupying fourth place in world iron ore production, Canada, with 21.3 million tons in 1957, soon will receive a major boost from the 25 to 40-million-ton production aimed for in the Mt. Wright-Wabush Lake area," says the publication. It goes on to report:

"Access hinges on either a spur connection to the east, joining the Quebec North Shore & Labrador Railway at about the 200-mile point on its way north to Knob Lake, or construction south to join Quebec Cartier's proposed railroad near Mt. Reed.

"Quebec Cartier Mining Co., wholly owned subsidiary of U. S. Steel Corp., is working on plans toward construction of a mill capable of producing 8 million tons a year of concentrates from about 20 million tons of crude iron ore. Quebec Cartier's interest lies with a group of deposits over a 70-mile zone from Mt. Wright to Mt. Reed. Preliminary plans are for a pilot plant at Lake Jeannine near the northern terminus of a 193-mile proposed railroad leading to a harbor at Shelter Bay. Part of the project is a 175,000-hp power development harnessing the Hart Jaune River.

"The largest property ever leased for iron ore reserves by Jones & Laughlin Steel Corp. sprawls over a 5640-acre plot in northern Quebec's Mt. Wright area. In this sparsely wooded land, under the muskeg of the Labrador Trough, about one billion tons of crude ore containing 335 million tons of concentrates have already been proved by diamond drilling. J & L, in partnership with Cleveland Cliffs Iron Co., holds a 99-year lease on the area—owned by Quebec Cobalt & Exploration, Ltd.

"Although Jones & Laughlin has no plans for the immediate development of the property it notes that after beneficiation to 66 per cent iron, the ore will be used as a feed for J & L's blast furnaces at Pittsburgh and Aliquippa, Pa., and Cleveland.

"In the adjoining area to the east Iron Ore Co. of Canada and Wabash Iron Mines (operated by Pickands Mather) are going ahead on other projects. IOCC reportedly is committed to a mining venture rivaling its Knob Lake operation in tonnage. Construction of the spur from the QNS&LRy toward Wabush Lake is under way and its background of experience may put IOCC ahead in starting output of concentrates."

Mathematics Grant

A $4,500 grant for research in the field of higher mathematics has been awarded to Illinois Institute of Technology, Chicago, by the National Science Foundation.

Basic research on "Interation and Functional Equations" will be done by Dr. Michael A. McKiernan, assistant professor of mathematics, under the one year grant.

McKiernan received his bachelor's and master's degrees from Loyola University and his doctor of philosophy degree from IIT.

Two-Day Conference

A two-day conference on Electronic Computation, sponsored jointly by the Kansas City Section of the American Society of Civil Engineers and the Structural Division of ASCE, will be held in Kansas City, Nov. 20-21, 1958.

Four half-day sessions are planned, and it is expected that the scope of the sessions will be broad enough to interest engineers just getting started in the field as well as advanced users of electronic computers.

All qualified workers in the field have been invited to submit papers for presentation at the conference.

Secretary of the Committee on Electronic Computation is Steven J. Fenves, Civil Engineering Hall, University of Illinois at Urbana.

During 1957, there were 1,300 fewer highway traffic fatalities than in the previous year.

Architect Firm Gets Contract

A contract was awarded July 1 to an architectural firm to design a multi-million dollar chemistry and chemical engineering building for Armour Research Foundation of Illinois Institute of Technology, it has been announced in Chicago.

H. A. Leedy, director of the Foundation, announced the contract was assigned to Schmidt, Garden and Erickson, Chicago. The proposed 125,000 square-foot building will be located on 35th street between Dearborn and Federal sts. It will be a three-story brick and reinforced concrete structure to match the modern architectural design of the other buildings on the Illinois Tech campus on Chicago's near South Side.

"We are planning to construct the building," Leedy said, "to meet the constantly increasing needs of industry and government for expanded chemical research. With the new building we will have a highly diversified and extensive range of chemical research facilities under one roof."

The building is the third in a ten year expansion program announced two years ago by Leedy. Already completed is a physics and electrical engineering research building at 3440 South State st., and nearing completion is an addition to the Foundation's metals research building at 3350 South Federal st. Planned in the program are a new administration building at 10 W. 35th st., and an addition to the mechanical engineering building at 3422 South Dearborn st.

The chemistry research building is scheduled to be the 26th new building at Technology Center since 1940 when Illinois Tech was founded with the merger of Lewis Institute and Armour Institute of Technology. Armour Research Foundation is a non-profit research affiliate of Illinois Institute of Technology, performing more than $14 million annually in research activities for industry and government.

The new laboratories will provide an excellent setting for some of the major research programs being conducted by the chemistry and chemical engineering group, Leedy said. These include comprehensive studies on ozone and its application to such things as the sterilization of blood plasma, its physiological effects, as well as its value as a missile propellant. Other subjects under investigation, according to Leedy, are paper chemistry, smoke tars, uses of saline water, useful products from chemical waste materials, and the chemistry of cancer drugs.

Pneumatic-Electric Systems Described

New, superior pneumatically driven electrical power systems based on the use of a recently developed turbonator and capable of operating in the high-temperature environment created by flights of high-speed aircraft were described in Buffalo, N. Y. on June 25 during the Summer General Meeting of the American Institute of Electrical Engineers.

Presenting a paper at a session on air transportation, Morton A. Slavin, of the General Electric Co., West Lynn, Mass., compared under Mach 3 flight conditions two pneumatic systems, one with the turbonator system exhausting directly into the ambient slip-stream and the second exhausting directly into the engine secondary air stream—and a shaft driven system based on the ball pump hydraulic constant speed drive. The turbonator is a single package containing a 24,000 RPM turbine wheel and generator on a common shaft.

"A turbonator system which exhausts into the engine secondary air stream can have significantly lower penalties to aircraft performance than either of the other two systems," he said.

Both of the pneumatically driven electrical systems, he said, can reduce airplane cooling penalties at no expense in power extraction penalties. With the turbonator requiring no external cooling for the two major heat dissipating components—the drive and generator.

He reported that the shaft driven and turbonator exhausting to ambient systems are "essentially a standoff" for use in an interceptor type plane and for a bombing mission over four hours in duration. For missions of long duration, he said, the turbonator shows advantage as the cooling penalty of the hydraulic constant speed and generator becomes quite large.

As the speed of aircraft increases, Slavin explained, the capability of the accessory power equipment to meet the added requirements imposed by such vehicles must also increase.

"One of the most difficult problems created by the increasing speed of aircraft," he said, "is the accompanying increase in ambient temperature. The choice of one type of accessory system over another could be determined by the amount of cooling each would require to meet these high temperature applications. In most cases the greater the cooling requirement, the greater is the penalty in aircraft performance."

A pneumatically driven electrical power system can meet the cooling requirements in Mach 3 flight at no expense in power extraction penalties, he said.

For More Space

A novel operation to increase a church's seating capacity from 222 to 392 persons in San Mateo, Calif., was described in *Engineering News-Record*. The original building was cut in half, the front half was moved 30 feet and two sections were inserted in the middle.

Dam Requires Moving Railroad

The construction and operation of Washington's Eagle Gorge Dam will require the relocation of 14 miles of the main transcontinental line of the Northern Pacific Railway, it was revealed at a convention session of the American Society of Civil Engineers on June 26 in Portland, Ore.

The railroad facilities requiring relocation are situated between Humphrey and Kanasket, Washington, according to William Inhelder, chief of survey branch, Seattle District Corps of Engineers, who presented a paper on "Engineering and Preconstruction Surveys" of the Eagle Gorge Dam project.

The Eagle Gorge Dam project is located on the upper reaches of Green River, on the west slope of the Cascade Mountains in King County, Washington. Both the left and right banks of Green River will be utilized in the railroad relocation, Inhelder said.

He revealed that a total of 14 route studies were made out of which four were selected as being the most feasible and warranted further consideration. Of these, the route identified as Route 4 became the relocation route.

Route 4 begins at a point near Humphrey. It crosses the Green River about one mile below Humphrey to the left bank of the canyon on a relatively flat grade. In the vicinity of the left abutment of the dam, it is held close to the spillway to reduce length and depth of through cuts.

From the axis of the dam the route continues along the left side of the canyon at or near maximum grade to Palmer, where it crosses the Green River to the right bank in the vicinity of Kanasket. From there the route follows a long tangent in northwesterly direction over a relatively flat plain.

This, Inhelder said, provides an ideal relocation site for the Kanasket yards. Finally, the route executes two opposite curves and rejoins the existing track.

The relocation will require the erection of three bridges. One, at the upper crossing of Green River, will be approximately 335 feet in length. The second, at Charley Creek, will be 440 feet, and the third, at the lower crossing of Green River, will be 570 feet.

"The plan of relocation along Route 4 is the most economical replacement of the existing line in a manner which will give the Company, as nearly as practical, the same degree of serviceability it now has," Mr. Inhelder stated.

This section of Northern Pacific's transcontinental railroad between St. Paul, Minn., and Seattle, Wash., was constructed during the period from 1885 to 1900. The track follows a water-level route along the banks of the Green River.

New Blasting Agent Is Cheap and Safe

A new blasting agent that is safe, easy-to-handle and effective can cut powder costs for surface blasting by as much as 75 per cent, reports *Construction Methods and Equipment.*

The explosive is a simple mixture of fertilizer-grade ammonium nitrate—which sells for about three cents a pound—and fuel oil. The mixture yields equivalent pound-for-pound results with 60 per cent gelatine dynamite.

The cost of loading a 30-foot deep hole, six and a half inches in diameter, with ammonium nitrate fuel-oil plus a primer is about $10.86, according to ammonium nitrate producers. The cost for loading the same hole with standard explosives is about $46.

In addition, in almost every case where ammonium has replaced standard blasting agents, drilling costs have been lowered up to 20 per cent. Because the new explosive is so cheap, overloading of drilling holes—considered too costly with standard blasting agents—is standard practice with ammonium nitrate. This means that spacing can be increased so that fewer holes are drilled.

However, ammonium nitrate as an explosive agent has several drawbacks that limit its application in the construction field. It cannot be used in a wet hole. It cannot be used underground, because it produces too much gas. Difficulties in loading horizontal holes make it impractical for this type of blasting. Also, it is more difficult to detonate than dynamite.

But when conditions are right, ammonium nitrate can be a real money saver for the contractor who has a quantity of surface blasting to do, the magazine says.

There is only one real danger present when ammonium nitrate is the blasting agent: the material is so safe to handle that workers tend to get carless and forget that any explosive is unpredictable to some degree.

Plastics Division To Hold Conference

The Reinforced Plastics Division of The Society of the Plastics Industry, Inc., will hold its 14th Annual Technical and Management Conference Feb. 3-5, 1959, at the Edgewater Beach Hotel in Chicago. The Conference and attendant industry Exhibit are open to non-members as well as members of the SPI.

According to Program Chairman James N. Grove of J. P. Stevens & Co., Inc., talks at the 14th Conference will stress new developments—in raw materials, in processing, in the joining of reinforced plastics, and in such major end-use fields as aircraft and missiles, commercial and military transportation, boating and tooling.

Ultimate in Bombardment: Brick

A pilot in a small private plane with a brick may ultimately be the most sensible way to conduct a bombardment, based on inflicting the maximum dollars worth of damage at a minimal cost.

In the meantime, until anti-missle missiles are perfected, the missile is the most efficient weapon ever conceived by man.

This was the message brought to more than 100 U. S. Air Force personnel at a July 11 briefing session in Los Angeles by Dr. Martin L. Klein, director of the Research Division of Cohu Electronics, Inc., San Diego, Calif.

"To evaluate a weapon," Dr. Klein said, "a figure of merit is established based on the number of dollars worth of damage a weapon does in terms of its cost.

"Thus a million-dollar missle that can inflict twenty-billion-dollars-worth of damage has a figure of merit of 2,000. This in fact, in the base terms of war, is the test of any weapon."

The Cohu research director added that the missile with an atomic warhead possesses a higher figure of merit for almost any tactical problem than any weapon yet devised by man.

The Air Force's giant Atlas, for example, is an incredibly low-cost method of strategic bombing. Following right behind in development is the Titan, another 5,000-mile missile with a top speed in excess of 12,000 miles per hour.

"These are the missiles that will, by 1960, replace the long-range strategic bomber as the most effective weapons in an arsenal equipped for global war," Klein said.

"At the moment, there is no way to intercept these missiles as they hurtle toward a target. This is what keeps its figure of merit high."

But, in one of the paradoxes of warfare, within two or three years he thinks it is certain that an anti-missile missile will be built which will intercept the Atlas and Titan. And as other new offensive weapons are developed, new defensives will be built to counter them.

"Thus, we will probably traverse the entire circle and a pilot in a Piper Cub with a brick will utimately be the most sensible way to conduct a bombardment.

"In the meantime," Dr. Klein said, "the missile is here to stay for a long, long time. It's the only scientific and economic way to go about this unscientific business of creating war."

Creative Trends

Creative trends in urban building will be the theme of the fourth annual National Construction Industry Conference to be held in the Sherman Hotel in Chicago on Dec. 10-11.

Sponsors of the conference are Armour Research Foundation of Illinois Institute of Technology, American Institute of Architects, American Society of Civil Engineers, Associated General Contractors of America, and the Building Research Institute.

The program will include some 16 papers dealing with new structural concepts, elements, and techniques as well as social, economic, political, and other forces influencing modern construction.

Inquiries concerning the conference should be addressed to Conference Chairman R. T. Mijanovich, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill.

Now, a 'Do it Yourself' Reactor

The main components of an Argonne National Laboratory "do it yourself" nuclear reactor which will be assembled at the Second International Conference on the Peaceful Uses of Atomic Energy are enroute to Geneva, Switzerland.

The reactor is the *Argonaut*—Argonne's nuclear assembly for university training, duplicate of a reactor now in operation at Argonne.

It will be assembled at Geneva coinciding with the start of the Conference by a team of eight Argonne scientists. The conference will be held from Sept. 1-13.

Components of *Argonaut* were packed into nearly 50 large overseas crates. The articles range in size from razor blades, nuts and drills to a 5,000 pound concrete shielding plug for the reactor.

The crates were transported by rail to New York. There they were loaded onto a ship bound for Amsterdam, Holland, where they will once again be transferred to rail cars for the trip to Geneva.

Dr. Bernard I. Spinrad, director of Argonne's Reactor Engineering Division and chief designer of the *Argonaut*, said: "This is the first time a full-scale, working nuclear reactor will be assembled in so short a time; its erection on the site of an international atoms for peace conference will, we hope, remove some of the mystery surrounding reactor design and operation."

Elmer W. Rylander, executive assistant for education at Argonne said: "The *Argonaut* has become an important tool in the atoms-for-peace training program conducted by Argonne's International School of Nuclear Science and Engineering. The *Argonaut* exhibit at Geneva will help keynote America's progress in nuclear science training to overseas nations, by showing the simplicity and 'do it yourself' approach which was foremost in the minds of *Argonaut's* designers. At a time when the need for technical training has been given wide publicity, it is interesting to note that this will be the only exhibit in the entire U. S. presentation that has education and training as its principal theme."

Rylander added: "It is our hope that the exhibit will remove some of the mystery asosciated with nuclear reactors, and stimulate interest in their use as an educational tool."

David H. Lennox, asociate chemical engineer in the Reactor Engineering Division will head the *Argonaut* project at Geneva.

Assisting will be: Harry Bryant, associate physicist in the International School of Nuclear Science and Engineering, and six members of the Reactor Engineering Division: Alan B. Smith, associate physicist; Frederick C. Beyer, associate mechanical engineer; Lincoln Henthorn, associate electrical engineer; William L. Kolb, designer; Alvin Engfer, chief technician; and Edward F. Groh, technical assistant.

Kolb left for Geneva early to check on the concrete floor preparation for *Argonaut*, on the grounds of the historic Palais des Nations. Kolb supervised the pouring of tons of concrete shielding blocks for the *Argonaut*. This was done overseas to eliminate unnecessary shipping costs.

Argonaut is a low power, low cost reactor of wide flexibility. It was developed by the Argonne Reactor Engineering Division primarily for research and use by students attending Argonne's International School of Nuclear Science and Engineering. At the ISNSE, courses are taught in reactor theory and nuclear physics.

Argonaut is designed to operate at an intermittent power development of 10 kilowatts. Its safety features and simplicity make it particularly suited for training purposes. It has received the attention of educators from this country and abroad.

The reactor is roughly 20 feet long by 17 feet wide by 9 feet high. It gives the impression of being made of giant building blocks because of the concrete shielding. A 3-ton capacity jib-crane projects out of the top of the reactor. The crane—which has a 20-foot beam—aids in the assembly and later acts as a giant arm in manipulating the high density concrete plugs and various reactor components.

Argonaut's ease of construction was brought into sharp focus on Jan. 10, 1958. On that date five Argentine scientists—who obtained *Argonaut* plans and techniques from Argonne—brought to criticality the first nuclear reactor built in South America. Their reactor is a replica of the *Argonaut*.

Raindrop Size

Determining raindrop size is being regarded as one of the first steps toward possible weather control, reports *Electronics*. There is little scientific knowledge of raindrop sizes. A professor of meteorology believes the knowledge will be useful for a variety of things, such as helping to reduce erosion of newly planted land and improving radar detection of storms so as to determine the amount and type of rain in them.

Frost Damage

A potential practical method for detecting frost damage in citrus fruits is already in experimental use, reports *Electronics*. X-rays are beamed through fruit rotating on a platform. Resistance to the X-rays is measured as a voltage, which increases in proportion to the non-uniformity of the fruit. Non-uniformity of fruit sections indicates frost damage.

'Bar Mill of Tomorrow' Unveiled

The "Bar Mill of Tomorrow" was unveiled in Chicago on June 24 at one of the nationa's most modern integrated steel operations — Republic Steel Corporation's South Chicago plant.

Those gathered for a preview saw for the first time what has been described by steel plant engineers as the most advanced bar mill now in operation in the American steel industry. Representing an investment of more than $18,000,000, the mill produces high quality alloy and carbon steel bar products.

T. F. Patton, president of Republic, said that the company incorporated all of the most advanced design features of existing bar mills and then added some unique features in its development of the "mill of tomorrow."

"The new bar mill at South Chicago, erected as part of Republic's three-year, $200,000,000 expansion program being completed this year, will provide high quality, hot rolled bar products, including very heavy bar coils, thus enabling the company to compete in several new market areas," he said.

"The South Chicago plant was the logical site for the new mill because of the growing markets for steel products in the Midwest and the plant's proximity to truck, rail, river and Great Lakes' shipping facilities," the Republic president concluded.

In brief, operations at the mill, which is almost automatic, consist of uniformly heating three and four-inch square steel billets and then passing them through a series of alternate vertical and horizontal rolling stands where the steel is gradually reduced to specified size and shape. After the bars pass through the last mill stand, they are run off onto one of two cooling beds where they are gradually cooled before being sheared into specified lengths for shipment. Steel being rolled for coils is passed through the last finishing stand and then into a coiler and onto a conveyor where the coils are gradually cooled and then made ready for shipment.

Incorporated in the mill are many unique features in design and operation. Some of them are:

Straightaway Operation — Utilizing the continuous mill principle, the steel being rolled is always moving in the same direction during its trip through the quarter-mile long mill. On most bar mills, the steel is reversed or looped through consecutive rolling stands.

Alternate Horizontal and Vertical Rolling—Alternate layout of the roll stands makes it possible to exert the necessary pressure on all sides of the steel without having to twist it or turn it. Thus, the desired effect on the steel is obtained without deformation of the bar. On most rolling mills, the steel is twisted or turned 90 degrees between mill stands, most of which are the horizontal type.

Vertical Looping—As the steel billet passes through each set of rolls, its size is reduced and its length increased. Upon reaching the last few finishing stands, since the speed of the steel is greater when leaving one stand than the speed at which it can enter the following stand, it has to be slowed or looped to keep it from piling up between stands. On other mills, the steel is looped off to one side or below the mill. On the Chicago mill, it is looped vertically above the mill while the speeds of the stands are synchronized. This is the first time this vertical looping principle has been employed in the design of an American bar mill.

Anti-friction Bearings—Operating in an enclosed oil bath, four anti-friction, mill bearings in each stand give rigidity to the mill housings, affording minimum roll deflection and extremely close control over the dimensions of the steel passing through. This permits closer than standard tolerances to be obtained.

The heating furnace, in which the steel billets are uniformly heated in preparation for their trip through the mill, can provide sufficient steel to produce up to 85 tons per hour of finished product. Maximum delivery speed of the mill is 3,000 feet of finished product per minute, or at the rate of approximately 35 miles per hour.

Following a break-in period of a few months, the mill will be operated almost automatically. Although approximately 200 employees are needed for two turns' operation of the mill, all but a few of these are employed in service and maintenance roles. Only six employees are needed to manipulate the controls for the actual operation of the mill.

Each of the 16 mill stands, through which the steel passes, is individually motor driven. This arrangement, together with an electronic control system, allows accurate speed control and synchronization as the steel travels from stand to stand. Horsepower of the motors ranges from 300 on the motor for the first stand, to 800 H.P. on the motor for the last stand. Power for the motors is supplied by two 3,500-kilowatt generators which are driven by a 9,800 H.P., 6,600-volt motor.

Location of the new mill between two existing bar mills at the South Chicago plant eliminated the need for additional roll shop and separate maintenance facilities.

The mill is capable of producing the following range of products: ⅜ to 1¼-inch rounds and the equivalent sizes of squares, hexagons, special sections, concrete reinforcing bars and one-inch to four-inch wide flats. The entire range of sizes can be rolled in straight lengths or into coils which weigh between 450 and 1,600 pounds.

Providing the steel for the new bar mill is one of the nation's modern steel plants. Republic's South Chicago plant,

constructed during World War II, has nine electric furnaces, four open hearth furnaces and one of the largest blast furnaces in the industry. The plant's annual steelmaking capacity is 1,697,000 tons of ingots.

Magnesium-Thorium Alloys are Appealing

United States Chemical Milling Corporation, Manhattan Beach, California, initiated their intensive research into the chemical milling of magnesium-thorium alloys co-incident with their first appearance on the market in commercial quantities.

The particular physical properties of these lightweight alloys most appealing to aircraft and missile manufacturers are their stiffness and strength.

Their value is indicated by the "use" figures for Boeing's Bomarc: 46 per cent of the upper wing surface, 32 per cent of the lower wing surface, and 100 per cent of the upper and lower elevator skins and doublers, fin and rudder skins and doublers, and the aft section of the monocoque body.

Because thorium is a weakly radioactive element, its toxicity in Mg-Th alloys has been investigated. A standard of 0.1 milligrams per cubic meter of thorium in air is a safe limit for continuous atmospheric exposure and is readily met in handling magnesium alloys containing up to 10 per cent thorium. Only long exposure to fine dust or fumes need cause concern as to radioactive toxicity of Mg-Th alloys.

For indoor storage of sheet and plate, the size of stacks of sheets should be limited to 1,000 cubic feet. Aisle widths should be not less than one-half the height of stacks. Such storage is in accordance with normal recommendations for fire safety.

Radiation surveys have shown that exposure of workers handling HK31A is well within the safe limits set by the A.E.C. Assuming hand contact and the body one foot away from the alloy for the entire 40 hour work week, the exposure would be 168 mr to the hands and 72 mr to the whole body. These are maximum values which probably would not be approached in actual practice. The corresponding A.E.C. permissible safe limits are 1500 mr/week for the hands and 300 mr/week for the whole body.

Building Addition

A $1,200,000 addition to the metals research building at Armour Research Foundation of Illinois Institute of Technology will be dedicated in Chicago Oct. 20.

The event will mark the completion of the second step in a 10-year expansion program announced by the Foundation early in 1956.

The four-story addition, on the north end of the building at 3350 S. Federal St., will more than double the amount of previously available space for metals projects, giving the department a total of 68,000 square feet of working space, according to Dr. Donald J. McPherson, manager of metals research.

Designed by internationally-known architect Ludwig Mies van der Rohe, retired director of the Illinois Tech department of architecture, the structure is the first addition to a new building on the IIT campus.

The original metals building was Mies' first building in the United States and the first building to be erected on the modern IIT campus. It was constructed in 1942 to house metals research on war projects.

The four floors of the addition will provide space for research sections of electrochemistry, and applied, powder, reactor, physical, and nonferrous metallurgy, as well as new reception and administrative offices for the department, McPherson said.

The basement will house a creep laboratory, mechanical equipment, and a storage area.

The original metals building will be devoted entirely to pilot plant and other large-scale operations, including the welding, foundry and steelmaking, and metallurgical processes sections.

The new addition is completely air-conditioned, including precision heat treating areas, according to McPherson.

Plans call for the construction of two more buildings and another extension to an existing building to complete the 10-year ARF expansion program.

The first building in the expansion was a $1,250,000 physics and electrical engineering building, completed in 1956. Plans now are being prepared for a multi-million dollar chemistry and chemical engineering building, scheduled to be located on 35th St. between Dearborn and Federal Sts.

The program also calls for a new administration building at 10 W. 35th St., and an addition to the mechanical engineering research building at 3422 S. Dearborn St.

The five construction projects will consolidate, modernize, and enlarge Armour Research Foundation's physical plant, now scattered over 10 buildings on the Illinois Tech campus.

Cool Comfort

An Italian firm has made driving a car in Summer as cool and comfortable as sitting on the front porch, reports *Product Engineering*. The open-topped, doorless car is equipped with cool wicker seats that are easily cleaned and virtually waterproof. The open top also simplifies loading of bulky hunting gear or golf bags.

His and Hers

A Cleveland meat company is packaging one small and one large steak together, reports *Food Engineering*. The large is labeled "His," the small "Hers."

Device Peers Through Furnace

An electronic device which uses nuclear energy to "peer" through the hot walls of foundry furnaces to keep a constant automatic check on the level of material inside, has been developed by Nuclear Corp. of America, the firm announced in New York City.

Nuclear also announced appointment of Whiting Corp., Harvey, Ill., manufacturers of heavy industrial equipment, as exclusive sales agent to the foundry trade for the new unit.

Called the Indicon I-100, the device projects gamma rays through the furnace to two Geiger counters, one mounted at the maximum fill level and the other at the minimum level. All components are outside the furnace, so the instrument is safe from corrosion and mechanical damage. Its signal can be harnessed to actuate automatic furnace controls, or it can register on a control board hundreds of feet from the furnace if desired.

If rays pass through the cupola to both counters unhindered, the unit registers the fact that the material in the furnace is below minimum level. If rays reach the top counter unhindered but reach the bottom one weakened by passage through material, the unit reports that the furnace has been charged to the right level for operation. If the rays reaching both counters are weakened by passage through material, the cupola has been overfilled.

Ruggedly built and involving no moving parts, the device is unaffected by heat, vibration, impact or continuous use. It can be used on cupolas up to 30 ft. in diameter. The standard unit is sensitive to within plus-or-minus 1/100th of the diameter. It requires only 150 watts, 115 v., 60 cy.

After studying a test installation, the Dearborn (Mich.) Iron Foundry of Ford Motor Co. put in a total of 14 Indicon I-100s. Two more are in use at Mallory-Sharon Metals Corp.'s foundry at Niles, Ohio.

Charge-level, or "stock-line," control is an important factor in foundry practice. Overcharging can cause clogged ducts, "hang-up" of and damage to the loading bucket, and improper furnace operation. Undercharging results in inefficiency and high operating costs.

Until now, cupola operators have had to gage stock level manually by plunging rods into the furnace. If a rod fails to go all the way in, it is presumed to have encountered stock, giving a crude indication of the level. These devices are undependable because the rod may strike or create a void in the stock and thus go all the way in even though the stock level actually is above the rod. The rods frequently stick in the stock or are bent by falling material, making them useless until repairmen can get inside the furnace.

The Indicon I-100 uses cobalt 60 as its radioactive source. The source is mounted in a lead safe with an aperture in it. When not in use, the source is kept away from the aperture so that no radiation escapes. During operation of the unit, a remotely controlled solenoid moves the source up into the aperture. The source's useful life is about three years. It can be replaced at minor expense, Nuclear Corp. said.

In the Dearborn Iron Foundry installations, the Indicon's signal is harnessed for automtic control. The loading bucket is made inoperative when the maximum charge level is reached. When the material drops below the minimum level, a time-delay relay is triggered which, if the charge is not brought up to the proper level in three minutes, shuts off the furnace.

Another feature of the Indicon I-100 is that the radiation picked up by the counters increases noticeably as the brickwork inside the cupola crumbles away. The increase is not enough to interfere with the unit's main function, but it does tell the operator that the wall is thinnning and may need repair.

Whiting Corp. said sales of the Indicon I-100 would be directed by C. McGlone, manager of the firm's cupola and accessories department, under the general supervision of A. R. Truc, Whiting sales manager.

ASHAE and ASRE Issue Joint Statement

In a joint statement issued by the councils of the American Society of Heating and Air-Conditioning Engineers and The American Society of Refrigerating Engineers it was announced they have approved in principle a method of merging the two Societies. The ASRE members in attendance at their 54th Annual Meeting authorized submission of this proposal for balloting by the ASRE membership.

E. R. Queer, ASHAE president, and Cecil Boling, ASRE president, further announced that present plans contemplate that the proposal for a merger and proxy ballots will be officially mailed to the members of both Societies in late October.

Full particulars of the merger plan will be mailed to the members of both ASHAE and ASRE by September. Ballots will be taken in person or by proxy at the 45th Semi-Annual Meeting of ASRE in new Orleans, La. on Dec. 1, 1958 and at a Special Meeting of the ASHAE membership on Dec. 1, 1958.

Trim Color Codes

Two of the three big auto producers will trim their color codes in half in 1959, declares *Textile World*. This move means less variety of color choices for auto buyers.

Subway Air Conditioning Licked

Subway air conditioning—the most difficult of all air conditioning—at last is licked.

In the past, subway cars with their rapidly changing occupant loads and high moisture problems have defied the best efforts of the industry.

Now, a system developed by Trane Company in its La Crosse, Wis., House of Weather Magic research center for use on New York Hudson and Manhattan subway cars is providing the answer. New York and New Jersey residents had an opportunity to "feel" the air conditioning in action while they rode six Trane air conditioned cars during an inaugural run early in July.

Subway air conditioning is unique. Nowhere else is the heavy density, short occupancy problem encountered with equal severity. In addition, the moisture factor resulting from crowds of people rushing from hot streets and subway tubes is especially burdensome.

The Trane system meets these problems head-on. Although listed as a nominal 10-ton cooling and heating system, tests show that the system delivers in excess of this rating.

This is how the system works:

The air conditioning system for each car consists of four major components —a compressor, a condenser and two cooling units. Both the compressor and condenser are mounted underneath the car and the cooling units are installed overhead, one at each end of the car so that no space is taken from the passenger area. Air from the cooling units is directed toward the center of the cars.

Each cooling unit contains a coil which is split horizontally into two equal sections—one upper and one lower section. Each coil section is provided with a thermostatic expansion valve and a solenoid liquid valve. In addition, each cooling unit has an electric heating unit which is also split into two equal sections.

The thermostatic expansion valve acts as a metering device to control the flow of liquid refrigerant through the coil system. The solenoid liquid valve is an electrically-controlled shut-off valve. When energized, it opens to permit liquid refrigerant to flow through the expansion valve and then into the coil.

In each car, the solenoid valves of the two upper coil sections are electrically connected so that they operate together. Likewise, the solenoid valves of the two lower sections are electrically connected. Each pair of solenoid valves is controlled by a relay which is, in turn, activated by a two-step thermostat.

As car temperature increases (above thermostat setting of 76 F), the first stage of the two-stage thermostat will close. This energizes the first relay and opens the solenoid liquid valves of the two upper coil sections. Liquid refrigerant will then flow into the coils and cooling will begin. If the car temperature continues to increase (above thermostat setting of 78 F), the second stage of the car thermostat will open the solenoid liquid valves of the lower coil sections to increase cooling capacity. As the car temperature is lowered (below thermostat setting of 78 F), the second stage of the thermostat will open. This will open the relay which closes the solenoid valves of the upper coil sections. When the car temperature is further lowered to 76 F, the first stage of the thermostat will close the solenoid valves of the lower coil sections through its relay. With the solenoid valves closed, refrigerant will be shut off from the coils and cooling can no longer take place.

Air Distribution

Each overhead unit provides 1500 cfm total air flow—or 3000 cfm from both units. Of the individual totals of 1500 cfm, 600 is outside air with 900 cfm recirculated. Combined, this results in 1200 cfm outside air and 1800 cfm recirculated air.

The Trane system also solves the problem of hot air invasion during multiple stops with repeated opening and closing of the doors. Hot, unconditioned air is kept out through untilization of positive pressure techniques.

By exhausting air inside the car through the open doors at stops, pressure is maintained which prevents outside air from entering. The system is designed to exhaust internal air at the rate of 1200 cfm.

To prevent any air build-up during longer runs, special grilles for exhausting purposes come into play.

As noted earlier, moisture control is particularly vital to the successful operation of subway air conditioning. Through the use of the split coil arrangement, Trane tests showed that humidity can be controlled at comfortable levels even when the car is packed with people.

According to Trane officials, the system is designed to provide cool comfort for the entire day—from rush hours to slack periods—from subway to hot sun in elevated runs.

With 1200 cfm of cooled outside air and 1800 cfm of refreshed, recirculated air, the system has been reduced to a fine science of combining cooled outside and recirculated air. With each car receiving 3000 cfm, a complete air change at least once every minute is achieved.

Missile Checks Self

The Air Force has developed a missile that checks itself before launching, reports *Electronics*. In the Bomarc missile, 140 separate steps are checked. If each step is working, the process takes 20 minutes. If a part is not functioning, the check stops automatically. The checker also checks itself to see if it is checking correctly.

APPLIED and BASIC RESEARCH

(Continued from Page 4)

industrial needs, working on such problems as heat transfer and the character of noise due to impact. The design of experiments is tough and the analytical problems are tough. There is hope on the horizon. As a more general familiarity with highspeed digital computing machines is obtained among our young people, a mechanism is available to solve these difficult analytical problems. Computing machines may supply the necessary sex appeal to draw not only bright young people but also our engineering and science faculties into the area which let me call "Classical Physics," symbolized by the blue books of the Cambridge University Press, current around the first two decades of the twentieth century with authors such as Love and Rayleigh.

Thus there is a lot of work to be done. These tasks must fall on the engineering community. The scientific community will always focus on problems of intrinsic value to science and not necessarily on problems that face the engineer. The engineers must do their own basic research in the engineering environment.

In conclusion, at times engineering progress has been made and will continue to be made without basic research; at times the converse is true. My plea is that it is necessary to look at the realities and make the right judgment in planning action. Let us stop worshipping false gods that engineering sets and rises with basic research. Nevertheless, we still need more basic research.

Welding Conference Slated for January

The 5th annual Midwest Welding Conference sponsored by Armour Research Foundation of Illinois Institute of Technology and the Chicago section of the American Welding Society will be held on Jan. 28 and 29 on the Illinois Tech campus in Chicago.

The conferences, begun in 1955 to bring together welding researchers and users of the processes to discuss current developments in the field, are attended annually by approximately 250 persons interested in the various phases of welding.

The program for the January meeting will include some 12 papers dealing with the latest developments in processes and applications.

The conference sessions will be held in the IIT Chemistry Building at 33rd and Dearborn Sts.

Inquiries concerning the conference should be addressed to Harry Schwartzbart, supervisor of welding research, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill.

Golden Promise Is Not Yet Realized

The golden promise of the atomic age —nuclear power—will not be realized until a number of serious technological problems have been solved.

A more economical means of producing nuclear power must be devised before it can become competitive with conventional power, according to Darwin Krucoff, of Armour Research Foundation of Illinois Institute of Technology.

Krucoff, supervisor of the reactor systems section in the ARF physics research departments, pointed out that the economics of power reactors has become as complex as the reactors themselves.

"Until the technogolical complexities are solved, the over-all problem of economics may forestall the benefits of nuclear power to many for five to ten years," he said.

The reactor systems section currently is working in two areas—reactor safety and advanced reactor concepts — to solve some of these problems. It is concerned with all phases of reactor design and development, including research, test, power, and propulsion reactors.

This research has resulted in the development of a new power reactor concept with interesting possibilities, according to Krucoff. Known as the "Armour Dust Fueled Reactor," the concept involves a new fuel form—fissionable dust carried in an inert gas."

"The dust fueled reactor concept has the advantages of greatly reduced corrosion and inherent high temperature capability, as well as all the advantages of fluid fueled systems," he said.

"Its unusual safety features and simple design appear very promising for the production of competitive nuclear power," he added.

In addition to research in reactor design and development, the reactor systems section also engages in reactor hazards analysis. Physicists investigate occurrences which could produce overheating and resulting damage to the reactor.

These occurrences can result from a variety of accident conditions, Krucoff explained, and may be followed by chemical reaction and unusual steam generation rates.

This research is aimed at modifying reactor design to minimize hazardous conditions and to enable the design of adequate containment structures within the reactor.

TV Safety Glass

A twin panel safety glass which is attached directly to a TV picture tube, eliminates the dust gathering surface on the tube's face and back, and also gives a clearer picture, reports *Electronics*. It produces a tube that is clean-for-life, since dirt can never reach the picture tube.

Feature Structural Developments

An international review of structural engineering developments will feature the national convention of the American Society of Civil Engineers in New York City, Oct. 13-17.

The convention will provide a setting for a joint meeting of ASCE's Structural Division and the International Association for Bridge and Structural Engineering, at which the most recent advances in structural design, research in the behavior of structures and properties of materials, and construction techniques will be discussed in eight half-day sessions.

Thirteen European engineers, representing eight countries, and 14 American engineers will be on the program, which has been arranged to give a well-rounded picture of recent advances and probable future trends in structural engineering, as well as presenting the most advanced current research and practice.

Special attention is given in the program to current trends in design of both steel and concrete structures. The plastic method of design of steel structures will be discussed in several papers, and reports of investigations of the effect of ductility, creep and fatigue will be given. Other papers are concerned with problems of stability, the design and performance of suspension bridges, fire protection, and fabrication and erection problems.

In the field of concrete, emphasis is on ultimate strength and limit design, prestressed concrete, folded plate structures and shells. The design of arch dams will be discussed in two papers, and other topics will include model tests, fire research, and the use of electronic computers.

Earthquake, blast and other dynamic effects on both steel and concrete structures will also be considered.

All the European and many of the American speakers are members of the International Association for Bridge and Structural Engineering, which promotes collaboration between scientists and engineers of different countries and provides a means for the exchange of ideas, theoretical and practical knowledge, and the results of research.

The meeting has been made possible by a grant from the National Science Foundation and other contributions from organizations and individuals, as tributes to the national and international leadership of ASCE and IABSE in the civil engineering profession.

Ships Get Missiles

The U. S. Navy Bureau of Ordnance has awarded a contract to Vitro Laboratories of Silver Spring, Md., for systems engineering required in arming three heavy cruisers with Talos and Tartar missiles. These ships are the *Albany*, *Chicago*, and *Fall River*.

Vitro Laboratories, a division of Vitro Corporation of America, is now working on systems engineering contracts on all but one of the Navy's guided missile ships afloat or building, including the new Polaris-carrying, nuclear-powered submarines.

These contracts call for coordination of the efforts of many different manufacturers who supply the sub-systems and components for the guided missile ships. Vitro's systems engineering work includes the Terrier heavy cruisers *Boston* and *Canberra* now in service with the fleet and 36 other missile ships under construction.

The Navy has identified these ships as the three Talos-Tartar heavy cruisers already mentioned, three Terrier attack carriers, three Terrier light cruisers, three Talos light cruisers, six Terrier frigates, thirteen Tartar destroyers, three Polaris nuclear submarines, the Terrier-Talos nuclear cruiser *Long Beach*, and the Polaris experimental test ship *Observation Island*.

Vitro Laboratories has worked with the Bureau of Ordnance in guided missiles research and development since the inception of the Navy's program in this field shortly after World War II. For this work Vitro received four separate Navy commendations plus the Naval Ordnance Development Award in 1957.

Vitro has played a key role in engineering analysis of missile design data and preparation of specifications for the Navy's current missile arsenal. Vitro also has performed extensive work in the development of new types of stowage, handling, and launching systems for these missiles.

AEC Lets Contracts

The Atomic Energy Commission has contracted with three firms for the preliminary design and analysis of heat exchangers and steam generators for nuclear power plant systems using liquid sodium as a coolant, it was announced on July 16. The firms are Griscom-Russell Company, Massillon, Ohio; Alco Products, Inc., Schenectady, New York, and Combustion Engineering, New York City, New York. Work being undertaken by these firms is expected to be completed in about eight months.

The contracts are the first of a series to be entered into under a Commission program for the development of less expensive and more reliable major nonnuclear components which can withstand exposure to liquid sodium coolants and operate at the high steam temperatures and pressures of modern electrical generating stations. This program complements Commission work being conducted on advanced sodium-cooled reactor systems.

Fifteen proposals for the development of heat exchangers and steam generators were submitted by industry in response to a Commission invitation.

New Products

As described by their Manufacturers

Railporter

An improved, heavier-duty Railporter is now offered by CHAIN Belt Company, Milwaukee. The new model is described as a portable Self-Propelled materials handler that transports concrete and other construction materials over an easily set up monorail system. It makes its round trips from supply point to destination unattended, even stopping automatically.

Compact in design, the Railporter has a large capacity. The power unit and the trailer unit carry a 29.2 liquid-level cubic-foot capacity; 20 cubic feet of concrete or 3000 lb. of blocks, bricks, stone, lumber. The 12-foot rail sections can be set-up at the rate of 450 feet of track per hour with a three-man crew. Additions to the tracks as the job progresses—or the adding of curves and switches to meet any job location needs, are easily made.

The new Railporter has greater strength at every stress and working point. Larger bearings are used in the outboard roller. Double-shoe brakes have been added. The stop plugs which are rail-inserted for automatic halting of the unit are heat treated for extra long service life. A new alloy steel drive wheel is now used. Controls are further simplified. A new rail stand is introduced also. This is a non-adjustable type for use on deck work. An improved adjustable stand is also offered for quick set-ups on uneven ground.

Railporter now features fully enclosed design with the engine housed inside a smart, funcfionally styled steel housing. Much greater accessibility is designed in the new Railporter. The standard V-drive belts which provide tractive power can be replaced in minutes without any disassembly.

A new catalog complete with job set-up information and product features is now offered. For information, please write *Midwest Engineer*, Key 701.

Structural Fiberglas

Structural Fiberglas-reinforced plastic panels are now being produced by the Resolite Corporation, Zelienople, Pa., with a special coating that increases the panels' weatherability — their resistance to erosion and their color stability—by several additional years.

The process, called Super - Hardcoat, represents a major improvement in plastic panels, according to the manufacturer. It is currently being used in the production of Resolite Fire-Snuf, a fire-retardant panel carrying the Factory Mutual Laboratories seal and the label of Underwriters' Laboratories. The process does not increase the flame spread rating of these panels, which is listed under 75. The new process has been tested and accepted by Underwriters' Laboratories, and can be applied to any of the standard Resolite products, as well as to Fire-Snuf, the firm says.

Structural plastic panels of this type are used by industry primarily for the daylighting of factories, and in commercial buildings for partitions and skylights.

Compound SP

A new compound that blankets and protects outdoor storage piles of bulk materials against loss from wind or rain erosion has been developed by Johnson-March Corp., Phila., Pa. The spray-applied solution contains specially developed additives for maximum coverage and penetration.

The solution, called Compound SP, is a blend of synthetic, organic, long chain polymers in a water base that form a thin crust which is tough, durable and highly resistant to weathering. In a series of heavier concentrations adaptable to a wide range of material composition, particle size and climatic conditions, they are suitable for coating stock piles of Bauxite, carbon, chromite concentrations, coal, Fluorspar, ilmenite, silicon carbide, sulphur and many other types of materials in outdoor storage piles.

The formed crusts are said to reduce the serious economic losses suffered each year through the disapperance of large tonnages of valuable material. In addition, community or plant dust nuisances are abated. Protection lasts for periods in excess of a year.

Compound SP is described as being inert, unreactive and non-toxic and without adverse effect on the burning qualities of coal or the subsequent processing of sulphur, metal ores, carbon, etc.

Application of the compounds is said to be easily accomplished with any type of spraying equipment from the small portable type up to commercial orchard spraying equipment. The special additives are included to provide proper wetting, penetration and coverage of the surfaces of even the smallest particles on the storage pile.

The solution is supplied in a number of different grades ready for spraying at the rate of one gallon of spray per 100 feet of surface. When desired, a color indicator is included at no extra cost in Compound SP to show where treatment has been made.

Self-Dumping Hopper

A new castered self-dumping hopper, specifically designed for corrosion-resistant service, has just been introduced by the Apex Welding & Fabricating Corporation of Bedford, Ohio.

The hopper has been equipped with a stainless steel liner for use with hot or cold and wet or dry materials which would normally corrode conventional equipment.

The hopper may be automatically dumped by releasing a specially designed gravity cam latch at the rear of the unit. After the load is dumped, the hopper rights itself and returns to the closed position, locking smoothly and positively. As an added safety feature, the hopper cannot be disengaged again until released by the operator.

Constructed of all-electric welded steel plate and structural steel, the new unit is designed for extra heavy-duty service.

Easily stored when not in use, the hopper is self-stacking and nesting without special lugs or attachments.

Available in five sizes, the new unit handles capacities of ½ yard, ¾ yard, 1 yard, 1½ yards and 2 yards. Lengths range from 49″ to 74″, widths from 40″ to 52″, and heights from 35″ to 46″.

Additional information may be obtained by writing *Midwest Engineer*, Key 702.

Flexible Couplings

A standard line of miniature flexible couplings has been developed by Bridgeport Thermostat Division, Robertshaw-

Fulton Controls Company, for use in close-tolerance applications.

Six different sizes comprising the complete line have been designed to eliminate all back-lash and transmit uniform angular velocity at high speeds. The flexible couplings are available in phosphor bronze and beryllium copper.

A hydraulically formed seamless metal bellows is employed as the heart of the flexible couplings to reduce bearing wear and excessive friction caused by misalignment of shafts. The flexible couplings also may be used effectively to dampen vibrations.

Shaft sizes range from $\frac{1}{8}$" to $\frac{5}{16}$". Overall lengths vary from $\frac{57}{64}$" to $1\frac{3}{32}$". Bellows and heads are delivered electro tin-plated.

According to the announcement, flexible couplings also will be designed and manufactured to meet customers' specifications.

Further information about the new standard line of flexible couplings is available by writing *Midwest Engineer*, Key 703.

Work Stations

New dual-purpose work stations, specially designed for research, engineering department or laboratory use, are offered by the Columbia Hallowell Div. of Standard Pressed Steel Co., Jenkintown, Pa.

A desk-height table top supported by a pedestal-type arrangement of cabinet files, the new unit, called a research and engineering station, combines a large open work surface with a great variety of available storage space.

The highly colorful, as well as versatile work centers, available in combinations of 12 basic hues, was introduced at the SPS booth No. 805 at the National Materials Handling Exposition in Cleveland, June 9-12.

The units put to work in a flexible way much of the space frequently wasted under tables or other work surfaces.

The new work station can be built up from standard units in a wide variety of sizes and configurations. File cabinet bases can be banked solidly or in knee-hole type arrangements with the work surface bridging across units.

Assembled work stations can easily be rearranged or moved to meet new needs or fit a different physical layout.

Choice and combination of colors simplifies the matching of these work stations to existing decor. Availability of other related steel equipment—shelving, parts drawers, office furniture—in the same colors permits building a plant or area-wide color scheme from scratch.

Pedestal bases may be built up of any Columbia desk-height file cabinets. These are 30 inches deep and come in three standard widths— legal size ($17\frac{3}{4}$ inches), letter size ($14\frac{3}{4}$ inches) and check size $12\frac{3}{4}$ inches.

An almost unlimited variety of drawer and cabinet space combinations can be obtained within each cabinet in the pedestal.

One-piece work surfaces, standing 30 inches high atop their base, come in widths up to 12 feet. Five- and six-foot widths are standard. Available table-top surfaces include linoleum, plastic, laminated wood, Shop-Top, stainless steel and albarene stone, among others.

Colors, which can be used singly or in two- or three-tone color combinations, include the following twelve: sunlight yellow, blond tan, vogue green, majestic gray, sandpiper tan, pine green, desert sage, seamist green, samoca beige, olive green, walnut and mahogany.

Additional information on research and engineering stations can be obtained by writing *Midwest Engineer*, Key 704.

Control Valve

A new high-pressure, four-way, open or closed center directional control valve for hydraulic systems has just been announced by Sarasota Precision Products Inc., designers and manufacturers of hydraulic valves and devices. Tradenamed The Spherotor, the new valve features high flow capacity with low pressure drop and minute internal leakage, if any. In addition, its basic design assures low turning torque for easy valving of fluids, even under high operating pressures. Built for operating pressures from 0 to 3,000 psi, the valve will handle hydraulic oils, non-corrosive fluids and lubricated air.

The Spherotor has a strong, lightweight, aluminum body and hardened steel operating parts. Its metal-to-metal seals are both spring- and pressure-loaded for positive sealing. The valve rotor is also pressure-compensated to reduce turning torque and eliminate the need for thrust bearings.

Advantages of the Spherotor also include: small, low cost, adaptable mounting for panel or in-line installations, positive wiping action of moving parts while opening or closing ports to prevent damage by dirty oils, simplicity of design which permits servicing of ports and seals with disassembly of the valve and exceptionally low maintenance.

The valve is available with either $\frac{1}{4}$", $\frac{3}{8}$" or $\frac{1}{2}$" dry seal pipe thread ports and made-to-order special porting at no additional cost.

The valve can be easily operated at full rated pressure, by applying 49 in./lbs. or 7 lbs. torque on the end of a 7" handle.

Each port is individually attached to the body and may be selected, changed or serviced without special tools.

For further details and complete specifications, write *Midwest Engineer*, Key 705.

More than 95 percent of vehicles involved in fatal accidents on U.S. highways in 1957 were in apparently good condition.

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C-6895 ASST. MANAGER BLDG. MAINT. BSME age to 45; 5 yrs. with air cond., heating, vent., elect. & plumbing eqpt., know heavy eqpt. in above areas. Duties: Supv. of operation, maint. & repair of heating, vent., air-cond., elect., plumbing, steam generating eqpt. & temp. control system incl. central panel operation & remote control of subsidiary eqpt. in large, modern office bldg. Also must be familiar with maint. & repair of bldg. struct. will supv. abt. 50 people in large loop bldg. sal. up to $180 wk. loc. Chgo. employer will negotiate the fee.

C-6899 SALES ENGR. Engrg.-prefer ME 3+ yrs. in sales to graphic arts field. Know rubber & rubber synthetic products. Duties: Sales - contacting printing press mfgrers. selling printers rollers. Must have good sales approach, travel, car furnished sal. $7500+ incentive Hdqrs. Chgo. employer will pay the fee.

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C-6922 DEVELOPMENT & DESIGN ENGR. Grad. Mech. age to 35; 3+ yrs. in mech. des. & devel., know application of plastic materials. Duties: All devel. & design of special machinery used in pipe line coatings. Very little board work sal. $8000+ loc. N.W. Chgo. suburb, employer might negotiate the fee.

C-6923 SALES TRAINEE Recent Grad. ME, Chem. or Elect. age to 30; 0-3 yrs. exper. in sales. Duties: Training program for company manufacturing recording instruments for power plants & chemical process industries. Will be sent to factory in East for 3 mos. & then work in office on general correspondence, quotations, etc. for 2-6 mos. & then in sales sal. abt. $600 loc. Chgo.

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Reactor for Teaching Purposes

A special reactor for teaching purposes in the area of nuclear engineering is expected to be operating at Iowa State College before the end of the forthcoming academic year.

A grant of $150,000 from the United States Atomic Energy Commission will furnish most of the funds necessary for the purchase of the reactor. Bids are to be taken on the project shortly, and actual construction is expected to start some time in the fall in the Chemical Engineering West Building.

The new facility will provide opportunities for training in the principles of reactor engineering. It will be used in connection with present graduate courses in nuclear engineering, and will be particularly valuable in thesis work, according to faculty members of the Division of Engineering.

Among the studies which can be undertaken with the new facility are the effects of radiation on materials placed within the reactor, the control of reactors, including how quickly they respond to changes in the control rods, the effect of changes in fuel, and heat transfer.

Students will be able to gain actual experience in operating the reactor, which is of a type designed especially for the training of students.

The reactor will be operated by the nuclear engineering group headed by Dr. Glenn Murphy, within the Division of Engineering. Dr. Robert Uhrig, who is spending the 1958 summer at the Argonne National Laboratory of the AEC in additional reactor studies, will be active in the operating program.

Iowa State was one of six institutions in the nation to receive grants for teaching reactors from the AEC recently.

The college was the second school in the United States to offer a graduate program with a major in the area of nuclear engineering. Statrting with a single course in 1951, a sequence of courses was begun in the fall of 1952, at which time the first master of science candidates were enrolled. Two degrees were conferred in the 1952-53 college year. During the past year eight degrees were conferred, and a total of 25 students carried major work in nuclear engineering. Work is now offered through the doctor of philosophy level.

"In developing the program of nuclear engineering at Iowa State College we have adhered firmly to the policy that specialization in nuclear engineering should be planned only at the graduate level, and that it is unwise to encourage specialization in this field at the undergraduate level," Dr. Murphy says. "Most of the problems in the design of reactors or in industrial applications of nuclear energy are conventional engineering problems with additional complications because of the nuclear transformation aspects. Thus, it appears best for a student to have a good engineering background before he specializes in the nuclear problems. However, we have admitted to our graduate program men with baccalaureate degrees in chemistry, in metallurgy, and in physics."

Students enrolled for the fall of 1958 include those sent by the Air Force, Army Corps of Engineers, Navy and Postgraduate School, and the Greek Atomic Energy Commission, as well as special students and fellows under grants from the United States Atomic Energy Commission, and regular graduate students.

The program at Iowa State College has been strengthened by the fact that Iowa State is the only school in the country which has a major laboratory of the United States Atomic Energy Commission on its campus.

"The cooperation of the Ames Laboratory has been an invaluable asset on several occasions, and continues to be an asset," Murphy says. "Because of the Ames Laboratory, highly qualified staff members are available for consultation on special problems, and some of them have taught courses in our nuclear engineering program. The opportunities in the Ames Laboratory have helped attract and hold good men in chemistry, metallurgy and physics as well as in chemical engineering. Relations with Argonne National Laboratory, near Chicago, are excellent."

A group of 31 institutions known as Associated Midwest Universities is now working with Argonne on ways and means of encouraging joint activities.

First major pieces of equipment for the nuclear engineering program was acquired in 1956, when a sub-critical nuclear assembly was built. This enabled students to observe the behavior of small atomic particles, primarily neutrons. In January 1958, the college received a grant of $36,340 from the AEC for equipment, and other items have been purchased through Engineering Division Funds.

In 1957, there were over 370 persons killed while crossing at an intersection with signal. Remember, cross cautiously.

Reviews of Technical Books

Engineering Electromagnetics

Engineering Electromagnetics, by William H. Hayt, Jr. McGraw-Hill Book Company, New York 36, N. Y. 1958. Pages, 328. Price, $8.75.

This is a clearly written, unusually teachable text for the modern junior-level introductory course in electric and magnetic fields. The author's primary objective is the development and understanding of Maxwell's equations.

The book introduces the electrical engineering student to electromagnetic theory in a way that enables him to readily understand more advanced texts. Thus, it gives him a broader view of the physical basis on which his electrical courses depend. The material includes electrostatics, the steady magnetic field, time-varying fields and Maxwell's equations, and concludes with a number of examples illustrating the applications of Maxwell's equations. Vector analysis is used throughout.

Although the development follows that of several more advanced books, the treatment is simplified, expanded, and well illustrated with problems to help familiarize the undergraduate with this theoretical subject. The author has combined such techniques as vector analysis, relativity, and solid-state physics into a logically developed, clear, unadorned presentation of electromagnetics at the junior level. Each new concept is elaborated by examples and problems.

In order to illustrate and clarify the use of Maxwell's equations, the final two chapters provide an introduction to skin effect, wave motion, circuit concepts, radiation, and relativistic effects. The sections on relaxation and iteration methods of experimental mapping are another unique feature of the book. An appendix on dimensions and dimensional analysis is a useful innovation.

This book has been written with the goal of making it easy as possible for the student to acquire a knowledge of the subject. This has been done by applying a carefully graduated scale of difficulty within each chapter and among the chapters themselves. The more difficult material has been placed near the ends of the chapters or at the end of the study of some definite phase of the subject.

The book contains two different kinds of problems: drill problems, scattered throughout each chapter, and chapter-end problems. In all, there are 86 of the former, each consisting of three similar problems, and 231 of the latter. The chapter-end problems are more difficult and include numerical problems, proofs, and discussions.

W. H. Hayt, Jr., has been teaching at Purdue University since 1946 and is presently associate professor of Electrical Engineering. He has been teaching in the field of electromagnetic theory for the past nine years on both the graduate and undergraduate levels, and has conducted and directed considerable graduate research in this area. He received his Ph.D. from the University of Illinois in 1954.

Strength of Materials

Applied Strength of Materials, by Alfred Jensen, McGraw-Hill Book Company, New York 36, N.Y. First edition, 1957. Pages, 343. Price, $5.75.

This one-semester text is written to acquaint the student with the strength and other properties of various engineering materials, and to teach him how to design various types of structural members and connections commonly found in machines and buildings.

Most of the subject matter taught in the usual college course on strength of materials has been included in this volume. A distinguishing feature of this book is that the developments of all design formulas have been accomplished without the use of calculus. In these developments the author has relied on thorough explanations of existing physical relationships and of the easily understood relationships of cause and effect, action and reaction.

This simplified approach is similar to that used in *Applied Engineering Mechanics*, also by Alfred Jensen, to which this book is a companion volume. The volume is, therefore, especially suitable for college courses in which the use of calculus is not required; also for courses offered in technical institutes and industrial training programs, since an understanding of high school mathematics is sufficient.

Each of the 12 chapters is composed of several articles, each of which presents additional theory, a new concept, or a different aspect, and contains one or more completely solved illustrative problems. These are followed by many problems arranged in order of difficulty, more than one-third of which are supplied with answers. Each chapter ends with a summary of its important points and formulas, giving students a quick review of its essential parts. Each summary is followed by a number of review problems and questions.

A departure in presentation of the subject matter is the strong emphasis placed on the actual design of structural members, parts, and connections. This emphasis is of particular advantage to those students who will not take further courses in design, and to those already in industry who need this volume for reference and self-study.

The special topics included in the text are: 1. axial stresses in members of two materials, 2. eccentrically loaded riveted joints, 3. design of laterally unsupported steel beams, 4. statically indeterminate beams, and 5. eccentrically loaded columns.

Dean Ovid W. Eshbach

Died March 4, 1958

Past President of the

Western Society of Engineers

The engineering and scientific fraternity of the Chicago area suffered a severe loss with the passing of Ovid W. Eshbach on March 4, 1958. He was a leader who carefully weighed the merits of each responsibility to which he was called and, upon assuming one, gave it his wholehearted effort.

His was a life rich in technical accomplishments. A graduate of Lehigh University with B.E.E. and M.S. degrees; holding a D.Sc. (hon.) degree from Ursinus College. He was a fellow of AIEE and member of ASEE, and AAAS. He was selected for membership in the honor societies of Eta Kappa Nu, Pi Tau Sigma, Tau Beta Pi, Sigma Xi, and was councilor-elect of Tau Beta Pi. He was also recipient of the Octave Chanute Medal (WSE, 1945). All of these speak for his technical competence. Further evidence of the breadth of his interests is found in his editorship of Handbook of Engineering Fundamentals and of his technical articles on magnetic properties of iron and steel, electric traction, and many other subjects.

Perhaps his most important and lasting contribution was his sympathetic interest in counseling young men regarding their careers and in helping them attain a breadth of understanding and a sense of responsibility for their professional life as engineers. His influence will live through this medium and "cast a long shadow" indeed.

Dean Eshbach joined the Western Society of Engineers in 1941 after coming to Chicago to become dean, Northwestern Technological Institute. His influence in the affairs of the Society was soon evident, and after initially becoming an officer in 1950, he served as President in 1952. Major improvements in the physical headquarters and in Society functions were successfully carried out under his administration.

He had a keen sense of civic responsibility and undertook many assignments where his abilities could be of value to the community. He was on the Board of Trustees of Perkiomen School and served on the Engineering Manpower Commission from 1951.

Above all, he had the respect and love of his fellow man, not only in his professional field, but also in his community, in his service club, in his church, and in the group privileged to join in his avocations.

Ovid Eshbach has left his mark in this world and will be greatly missed.

RESOLVED: That this Memorial be recorded in the minutes of this meeting and that the Secretary of Western Society of Engineers send a copy thereof to Mrs. Eshbach as a token of our deepest sympathy.

Signed: H. P. Sedwick;
Robert L. Anderson;
Allan E. Bulley

News of Engineers

J. Stewart Stein, MWSE, Chicago architect, member of the firm of Walter H. Sobel - J. Stewart Stein, Architects and Engineers, with offices at 450 E. Ohio St., Chicago, and 10011 W. Grand Ave., Franklin Park, Ill., was recently elected National President of the Construction Specifications Institute, whose headquarters are in Washington, D. C.

The organization consists of architects, engineers, specification writers, and associate members representing the building industry. To date, there are 3,000 members belonging to 29 chapters located in the major cities of the United States. The Chicago Chapter has a membership of 240.

Succeeding Stein as vice-president, is Willard H. Barrows of New York City. Harry Plummer, Washington, D.C. was elected secretary-treasurer. Stein, Barrows and Plummer will serve during the 1958-1959 term.

Construction Specifications Institute held its Second Annual Convention in Cleveland, Ohio, July 5-7, at the Pick-Carter Hotel.

* * *

Henry C. Spencer, director of the technical drawing department at Illinois Institute of Technology, Chicago, has received the national Distinguished Service Award from the engineering drawing division of the American Society for Engineering Education.

The honor was presented June 17 at the society's annual meeting at the University of California.

Spencer was cited for "having done outstanding work as a teacher with ability to inspire students, improvement of the tools and conditions for teaching, improvement of teaching through various activities, scholarly contribution, and service to the division of enginering drawing of the ASEE."

Spencer came to Illinois Tech in 1941 from the Agricultural and Mechanical College of Texas, where he had been head of the engineering drawing department. He organized the IIT technical drawing department—now the only such department in the country to offer a bachelor's degree in technical drawing and a master's degree in engineering graphics.

Active in the engineering drawing division of ASEE for over 25 years, Spencer was national chairman of the division in 1948. He is author or co-author of 10 books in his field, including *Technical Drawing*, now in its fourth edition, and *Basic Technical Drawing*, published in 1956.

Spencer received a bachelor's degree from Baylor University and a bachelor's and a master's degree from Texas A & M College.

* * *

John A. Logan, professor of civil engineering, has been named chairman of the department of civil engineering at the Northwestern University Technological Institute.

He recently was elected to the Institution of Civil Engineers, oldest engineering society in the world. Only six Americans hold memberships. Logan succeeds Robert B. Banks as department chairman. Banks plans to devote additional time to research at Northwestern.

A native of Canada, Logan holds undergraduate degrees from the University of Saskatchewan and master's and doctor's degrees in sanitary engineering from Harvard University.

He has been a member of the Northwestern faculty since 1954, after spending eight years as a U.S. Army consultant and member of the Rockefeller Foundation staff.

A consultant to the World Health Organization and International Cooperation Administration, he holds the United States Ribbon of Merit, Medalha de Guerra from Brazil, and the Italian Erlaas Medal.

* * *

A native of Norway was awarded a first prize of $100 for his paper entitled "Materials Handling" in the sixth annual Wunsch Foundation essay contest at Illinois Institute of Technology in Chicago.

Oyvind B. Hansen, 527 Belleforte, Oak Park, Ill., a January industrial engineering graduate, received the honor. He currently is employed as a methods evaluator at Pioneer Publishing Co.

The contest was established by the Wunsch Foundation of the Silent Hoist and Crane Co., Brooklyn, N. Y., to stimulate interest among engineering students in the science and application of materials handling.

A second prize of $50 went to J. J. Rochford, Jr., 2114 W. Cuyler ave., for his paper, "Revision of Plant Layout to Eliminate the Waste of Valuable Floor Space." Rochford is a mechanical engineering student in IIT's evening division.

Honorable mention awards were made to Eugene Kowalski, 304 W. Roscoe St., for his paper entitled "Layout, Material Flow, and Materials Handling Study of Department A," and Ronald Scoville, 173 Elder, Chicago Heights, Ill., for his paper, "Analysis of Production Materials Handling in the Turret Lathe Section of A. K. Jenson, Inc." Both are evening division students.

The 25 entries were considered by the faculty board of review, consisting of Dr. Maurice D. Kilbridge, director of industrial engineering, chairman; H. Raymond Swenson, assistant professor of industrial engineering, and George Phillips, and Leroy A. Wickstrom, both instructors of industrial engineering.

* * *

Professor Norman N. Barish, chairman of the industrial and management engineering department at New York University's College of Engineering, has been named associate dean of the college. His appointment was announced July 1 by Dean John R. Ragazzini.

Professor Barish, an authority on business systems and organization, served as acting dean of the college during the 1957-58 academic year. He has been secretary of the college since 1948.

Before going to NYU in 1947, he was an engineering consultant, an industrial engineering supervisor for the Radio Corporation of America, and an economic analyst in the federal Office of Production Management. He holds bachelor's degrees from the City College of New York and the University of Michigan and a master's degree from the University of Pennsylvania.

Professor Barish is the author of *Systems Analysis for Effective Administration* and a co-author of *Case Studies in Industrial Management*. In addition, he has written numerous articles for professional and business journals.

He is past president of the New York chapter of the American Institute of Industrial Engineers and an active member of several other professional groups.

He also holds membership in four honor societies—Phi Beta Kappa, Tau Beta Pi, Pi Tau Sigma, and Alpha Pi Mu.

* * *

Dr. Harold S. Black, Bell Telephone Laboratories, Inc., research engineer, whose more than 60 inventions have made major contributions to long distance and over-seas telephone communications and to the field of electronics, has been awarded the 1957 Lamme Gold Medal by the American Institute of Electrical Engineers. The Medal, a major engineering honor, was presented to Dr. Black on June 23 during the Summer General Meeting of AIEE in Buffalo.

Dr. Black was honored "For his many outstanding contributions to telecommunications and allied electronic arts, especially the negative feedback amplifier and the successful development and application of the negative feedback amplification principle."

Other distinguished scientists and engineers such as Edward Weston, Vannevar Bush, Comfort A. Adams, and V. K. Zworykin have been recipients of the Medal, which was established in 1924 to honor a member of AIEE "who has shown meritorious achievement in the development of electrical apparatus or machinery."

In selecting Dr. Black for the 1957 Award, the Lamme Medal Committee, headed by H. I. Romnes, New York, was guided by a number of recommendations by Dr. Black's superiors and those who have had long acquaintance with his career. Among these, one pointed out that without the stable distortionless amplification achieved by his invention, "modern multichannel transcontinental and transoceanic communication systems would be impossible." Another termed him "A preeminent figure in the development of communication systems and one of the great inventors of all time." Still another stressed the importance of the negative feedback amplified to military electronics and said that the feedback amplifier theory "is the foundation of electronic automation which has its most expansive application in radar control of weapons and missiles. . . . The negative feedback amplifier is not just another obvious development but represents, rather, one of those rare inspirational flashes that change the course of the whole industry."

In addition to his many inventions, Dr. Black is the author of a book *Modulations Theory*, and is the author and co-author of numerous technical articles on communications.

Science, engineering, research and industrial organizations have honored him during his career. In 1940, the National Association of Manufacturers named him a "Modern Pioneer" in "recognition of distinguished achievement in the field of science and invention." In 1945 he was awarded the John Price Wetherill Medal of the Franklin Institute. The War Department awarded him a Certificate of Appreciation in 1946 for his assistance during World War II. He received the 1952 annual award of the Research Corporation in recognition of his invention and development of the negative feedback amplifier, and his alma mater, Worcester Polytechnic Institute, honored him with an honorary degree of Doctor of Engineering.

Dr. Black has been on the Bell Telephone Laboratories technical staff since 1925. A native of Leominster, Mass., he is now resident of Summit, New Jersey.

Dr. Black is a Fellow of AIEE, the Institute of Radio Engineers and American Association for the Advancement of Science.

* * *

Promotion for five executives involved in operation of Gardner-Denver Company plants have been announced by G. V. Leece, president, in Quincy, Ill.

Robert Williams, formerly works manager has been named general plant advisor. He will serve as consultant on matters pertaining to manufacturing and production in the company's plants in various parts of the world.

A. J. Kathmann, assistant works manager, will assume the position of works manager.

G. A. Schumacher, formerly superintendent of the LaGrange, Mo., foundry, has become manager of foundry operations, with headquarters in Quincy. E. J. Brown has been promoted from assistant superintendent of the LaGrange foundry to superintendent.

James A. Van Doorn, in addition to his duties as manager of facilities, has also been placed in charge of Gardner-Denver's maintenance divisions, Leece said.

Williams joined Gardner-Denver in 1939, starting as assistant works manager. He became works manager in 1947 and continued in that capacity until his new assignment.

Van Doorn began his Gardner-Denver career in 1925 in the engineering department after being graduated from the University of Illinois. He served in sales offices in New York, Pittsburgh and Tulsa, being district manager of the latter for eight years. He returned to Quincy as production manager in 1944 and was named plant facilities manager in 1955.

Kathmann joined the company in 1945 in the design department and was appointed chief tool engineer and head of the tool design department four years later. He became assistant works manager last year.

Schumacher came to Gardner-Denver 10 years ago as superintendent of the LaGrange foundry. He was graduated from the University of Michigan as a mechanical engineer. Brown, who attended Bridgeport Engineering College, joined the firm the same year in the foundry inspection department. He was named foreman of the LaGrange core room in 1949 and assistant superintendent of the foundry in 1957.

* * *

A 48-year-old engineer has been named to take over the reins of Graver Tank & Mfg. Co., East Chicago, Ind., 101-year-old supplier of steel fabrications to industry.

Edward N. Gosselin, chairman of the Board announced the appointment of W. Clark Root to the position of president and chief executive officer of Graver Tank. Gosselin also announced that Jalmer E. Swason, current president of Graver, has moved to the post of vice-chairman of the Board.

In announcing the Board of Directors' action, Gosselin said, "The pace of our current and projected business plans, make it important that younger men carry the burden of responsibilities from now on.

"The dynamics of this country's business as related to Graver Tank demand the continuity of responsible and aggressive leadership of excutives."

Root joined Graver Tank in April, 1958 as executive vice-president. Previously he was project manager for Canadian Bechtel, Ltd.

Cave Serves as Giant Freezer

Refrigeration equipment has been used to transform a one-hundred-acre man-made cave into one of the most convenient freezer storage facilities in the country. The cave, located eight miles west of Kansas City, was created by 20 years of mining rock from a quarry. Inland Cold Storage Company, using refrigeration equipment manufactured by The Trane Company, La Crosse, Wis., has made it into an underground cold storage warehouse with space for 70 million pounds of frozen food.

In 1952, someone realized that the mined-out area of the quarry was a natural cold storage warehouse in the rough—one that would cost millions to duplicate. Besides being carved out of solid rock 175 below the surface, it held a constant temperature of 55 F, winter and summer.

There were also location advantages. The quarry, situated near the geographical center of the United States, is on the line of a major railroad and is accessible by six major highways.

System Design

The huge storage chambers are separated by cement block walls and six-inch foamed glass insulation with a vapor barrier. Should power fail, the temperature would rise no more than three degrees in 60 days. (Power failure could result in a five-degree temperature rise per day in a conventional cold storage warehouse.)

Although this is a "dry cave" with no underground waters, the relative humidity inside the undeveloped area stays between 85 and 90 per cent. It was necessary, therefore, to design the refrigeration systems not only for the control of dry bulb temperatures, but for proper moisture removal.

The design included calculation of sensible and latent heat gains. These calculations were complicated by the fact that little or no published data on heat transfer coefficients for solid rock were available. Loads had to be determined from empirical formulas. Once the heat gains had been established, equipment selection presented another problem as the result of an interesting phenomenon.

In most applications involving humidity control, the rate of flow of water vapor into controlled space increases as humidity and vapor pressure within the space are lowered. In underground applications, however, the reverse is true. A gradual, but sizable, drop-off in load occurs until stabilization is reached, according to Fred Ladewig, Trane Kansas City district manager, who assisted in researching the project.

Refrigeration equipment must be selected with sufficient capacity to pull the room down to the specified condition within a reasonable length of time, but care must be taken not to *oversize* the equipment, realizing that the load will gradually decrease, Ladewig noted.

"High" Temperature Rooms

Most of the space was designed to store frozen food, but the cave also handles other commodities at temperatures above freezing. For example: several "high" temperature rooms are maintained at 32F dry bulb and 55 per cent relative humidity—a fresh produce room is held at 32F dry bulb and 85 to 90 per cent relative humidity—and a potato storage room is controlled at 40F dry bulb and 85 to 90 per cent relative humidity.

To serve the "high" temperature spaces, five separate Refrigerant-12 systems were installed. Each system contains a 15 HP reciprocating compressor and evaporator units with built-in electrical defrost, suspended from the rock ceiling at strategic locations. Condensing of the refrigerant is accomplished by air-cooled condensers in the cave where the ambient temperature remains a constant 55F.

The compressors are not connected in parallel, but are installed in separate systems so that each will operate under certain conditions without being affected by another system. The systems will also permit flexibility of equipment relocation, if necessary, for future changes in storage operations.

The refrigerant piping was arranged for proper pitch, and sized for velocities which would provide continuous return of oil from the system to the compressor without the use of an oil separator. This was accomplished in spite of the fact that the piping runs extend 250 and 300 feet to the last evaporator unit on the line.

Design of Freezer Rooms

The design of the freezer rooms includes a calcium chloride brine circulating system employing ammonia compressors. The brine is cooled to —17F in large shell-and-tube heat exchangers equipped with suction domes. It is then circulated by pumps through seamless steel pipe to over 50 large centrifugal type coolers located in the storage area.

There are six 9-cylinder ammonia compressors and four boosters now installed, with a total of 520 horsepower. Shell-type ammonia condensers are 24 inches in diameter and 18 feet long.

In addition to the usual gas-and-liquid cooler, there are desuper-heaters in the discharge lines from both the booster and second stage machines. These are equipped with thousands of square feet of finned surface and are cooled by fans which handle air introduced from and returned to the mine area.

The frozen food storage areas are held at —4F to —6F. After two and one-half years of operation, the frost line in the rock floor under the freezer rooms extends to a depth of 22 feet.

The Project

The cave was converted into a warehouse at a cost of $2,000,000, compared

to an estimated $5,000,000 to build a conventional warehouse of equivalent capacity.

Inland Cold Storage Company has developed into a thriving business. Among many accounts are such names as Minute Maid, Snow Crop Corp., A & P, and the United States Army. They are the frozen food distribution center for all A & P stores in Kansas, Missouri, Nebraska and Iowa—as well as for all military installations in the Midwest. In addition to in-transit storage, they carry an emergency stock of food for the army on a five-year rotating plan.

The refrigeration project was engineered by J. F. Daly and T. R. Barber of Los Angeles, in consultation with F. K. Ladewig, district manager of The Trane Company, Kansas City, Mo. Installation was supervised by Robert E. Clark, maintenance engineer for Inland Cold Storage Company.

Radiography Growth In Ten Years Cited

Extensive growth during the past ten years in low voltage radiography, which is especially useful for x-ray of thin metal, wood, plastic, and biological specimens, was cited June 11 by Harold F. Sherwood, an Eastman Kodak x-ray research scientist.

Sherwood spoke at a Microscopy Symposium at the Del Prado Hotel in Chicago. He said that the x-ray growth is related to a scientific drive to obtain information about the minute structure of opaque substances.

Spurred by this interest, he said, scientists have sought new x-ray equipment and developed new radiographic techniques, such as those with thin window x-ray miscroscopes, finer grain photographic emulsions, and new methods of preparing specimens.

Sherwood outlined principles required to obtain the maximum in radiographic image quality. These include selection of a suitable quality of radiation, films that will permit the maximum magnification desired, and correct geometrical conditions.

In contact microradiography, specimen and film must be in very close contact because of later optical enlargement of the radiograph, Sherwood said. He described a vacuum exposure holder that insures good contact.

The Kodak scientist also discussed the importance of selecting films to meet the degree of magnification to be used in examining the radiograph, uniform development, and the need for processing some films immediately after exposure.

Stanford to Maintain Document Depository

The United States Atomic Energy Commission has contracted with Stanford Research Institute to maintain a classified documents depository to serve the western states, it has been announced. The depositary includes an initial collection of 7,000 reports dealing with various aspects of nuclear energy research.

The new facility will serve scientists and engineers from firms holding AEC access permits. There are more than 140 such firms in California. Similar AEC depositories are located in Idaho Falls, Chicago, Oak Ridge, Washington, New York, and Boston. Arrangements for the use of the SRI depository are made through the San Francisco Operations office of the Commission, located at 518—17th Street, Oakland, California.

The new facility further expands the Institute's nuclear energy information services. An AEC unclassified depository, available for business groups and individuals interested in nuclear energy, has been in operation at SRI since 1954. Reports in this collection contain information on technological developments which have been declassified for peacetime applications of nuclear energy. Also available are other publications on atomic energy, including the full set of proceedings from the First International Conference on the Peaceful Uses of Atomic Energy, held in Geneva in 1955.

Both depositories are operated by the SRI Documents Center, headed by Roy A. Johnson.

Nylon Zipper

A new nylon zipper is being readied for market, says *Product Engineering*. Instead of having individual molded teeth like an ordinary zipper, or interlocking grooves like the plastic zippers on pouches and portfolios, this one has interlocking surfaces made by intertwining extruded nylon filaments.

Place to Park

A unique solution to parking problems at industrial plants has been developed by two British companies, declares *Purchasing Week*. The system stacks cars on concrete racks using fork-lift trucks. The racks can be two, three, or four tiers high, and the trucks are fitted with hydraulic forks capable of lifting up cars 21 feet in one minute.

MIDWEST ENGINEER
Advertisers' Index

Effects of Noise To be Discussed

Progress in development of standards industry can use to determine the effects of noise on hearing will be among major topics to be discussed by leading acoustical engineers at the 9th annual National Noise Abatement Symposium to be held in Chicago, Oct. 9-10.

The symposium, to be held in the Hotel Sherman, is being sponsored by Armour Research Foundation of Illinois Institute of Technology, Acoustical Society of America, American Society of Safety Engineers, National Noise Abatement Council, American Society of Planning Officials, American Industrial Hygiene Association, Acoustical Materials Association, and Noise Control magazine.

Research in the hearing aspect of industrial noise control will be described in a paper by Floyd E. Frazier, director of the industrial division of the National Association of Mutual Casualty Companies.

Other speakers on industrial noise control problems will include Herbert J. Weber of American Foundrymen's Society, and Allen L. Cudworth of Liberty Mutual Insurance Co. The discussions will cover corrective measures in the field as well as research.

A session devoted to jet airliner noise control problems will include papers prepared by Leo L. Beranek, Laymon N. Miller and Karl D. Kryter of Bolt, Beranek and Newman, Harry H. Howell of Boeing Airplane Co., and E. E. Callaghan of the Lewis Flight Propulsion Laboratory of the National Advisory Committee for Aeronautics. The papers will deal with various aspects of the jet airliner nōise problem, including airport operations, flight test data, and flight noise supressor design.

Product quieting will be dealt with in papers on a new laboratory test for sound transmission through acoustical ceilings by Richard N. Hamme of Geiger and Hamme, noise acceptance criteria for home appliances by Warren E. Blazier, Jr., of Coleman Co., and motor design by R. L. Wall of General Electric Co.

A number of exhibits of products used in noise control and measurement will be open throughout the two-day meeting.

Inquiries about the symposium should be addressed to Conference Chairman Hale J. Sabine, physics research department, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill.

Nuclear Congress Scheduled for 1959

The 1959 Nuclear Congress, described as "the year's most comprehensive meeting devoted to peaceful uses of atomic energy," will be held at Cleveland, Ohio, April 5-9, 1959, it has been announced by Engineers Joint Council.

The four component sections of the congress will appeal to engineers, scientists, industrial executives, researchers and manufacturers and users of peacetime nuclear devices.

To be held at the Cleveland Auditorium, the congress will be sponsored by over 30 leading engineering, scientific and management groups. Designed to gather and make available the latest information in dozens of fields of nuclear specialization, the congress will be open to any interested persons from the United States or abroad.

Theme of the congress will be "For Mankind's Progress."

Major parts of the congress include the Nuclear Engineering and Science Conference, at which over 150 papers will be presented covering such fields as reaction design, disposal of radioactive wastes, radiation shielding and instrumentation.

A third portion, the Seventh Hot Laboratories and Equipment Conference, will cover techniques and devices useful in laboratories handling radioactive materials.

Concurrent with the technical sessions will be the AMTOMFAIR, an exposition at which manufacturers of equipment used in the nuclear field will display their recent developments.

Further information on the Congress, said the announcement, may be obtained by writing to the coordinating body, Engineers Joint Council, 29 West 39th St., New York 18, N. Y.

Small Gas Turbine Is Subject of Paper

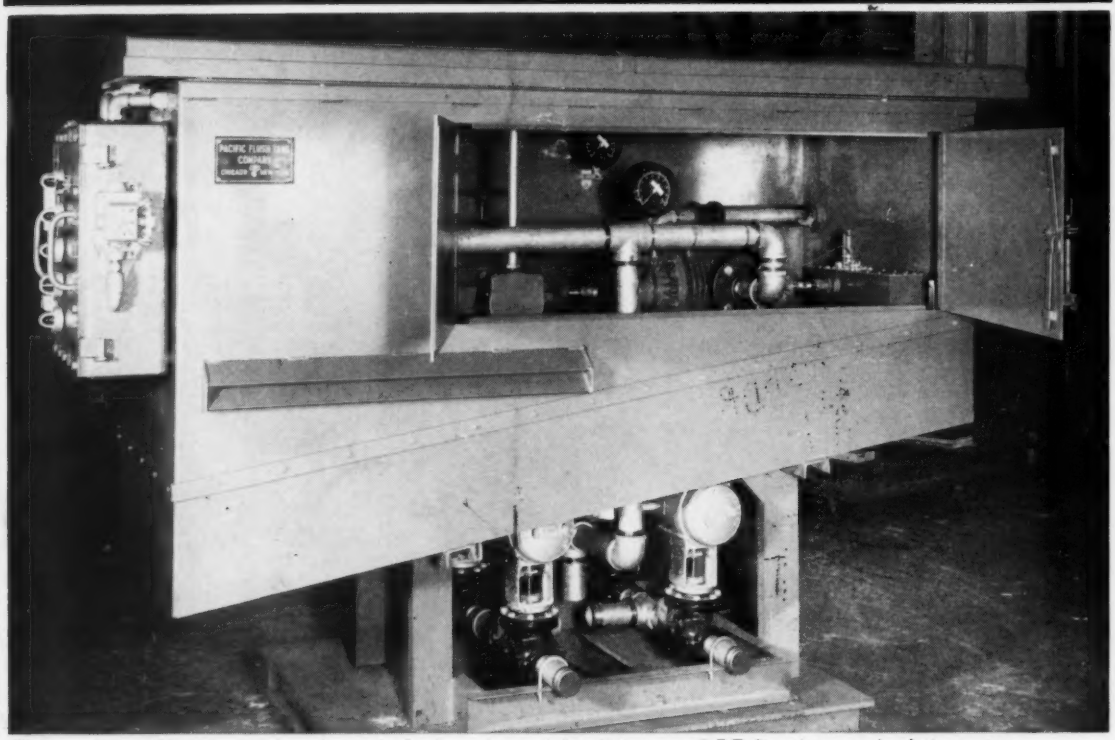
Recent development of small gas turbines "again opens the door to the possibility of the d-c electric starter and starter-generator doing a useful job on the smaller gas turbine powered planes and helicopters."

So said C. D. Fearnot, General Electric Company, Erie, Pa., in a paper presented June 27 at the Summer General Meeting and Air Transportation Conference of the American Institute of Electrical Engineers in Buffalo, N. Y.

At the same time, he said, "a greater challenge is presented to the electric starter designer. The smaller the engine, the higher as a rule are the engine speeds. Not only has the maximum speed doubled and tripled and perhaps quadrupled but light-off speed as a per cent of maximum speed has increased from perhaps 6 or 7 per cent to around 10 to 12 per cent. On the larger engines, if a starter could get the engine past the firing point, the battle was just about won. With the smaller engines only half the battle is won. The increase in self-sustaining speeds from 10 to 15 per cent up to as high as 25 per cent has made this area a very critical part of the starting cycle."

P.F.T.

NEW DEVELOPMENTS IN SEWAGE TREATMENT



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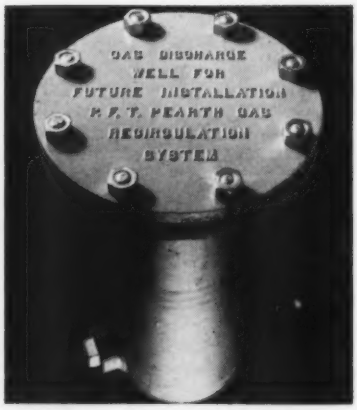

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